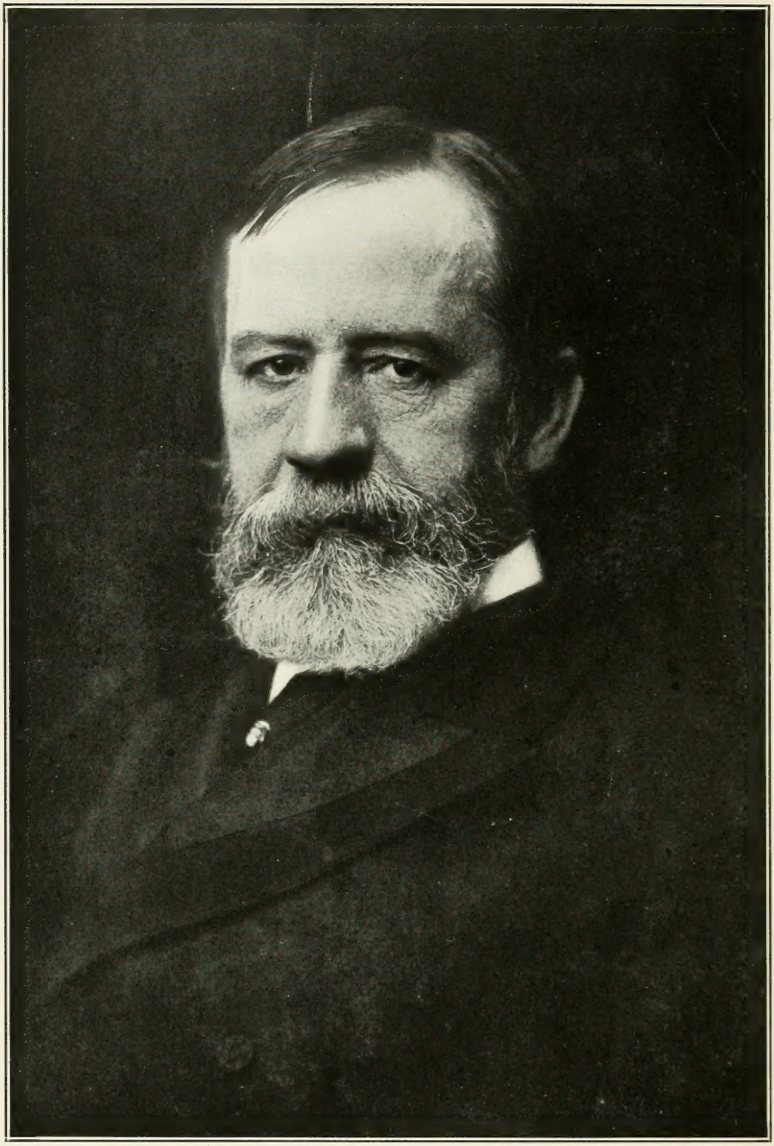
ANDREW CARNEGIE
25 Nov. 1912

National Tuberculosis Assoc

NATIONAL ASSOCIATION FOR THE STUDY AND PREVENTION OF TUBERCULOSIS

SEVENTH ANNUAL MEETING
DENVER, COLO.

1911



Edward G. Janeway
August 31, 1841–February 10, 1911

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The National Association for the Study and Prevention of Tuberculosis

TRANSACTIONS
OF THE
SEVENTH ANNUAL MEETING
DENVER, COLO., June 20–21, 1911

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1911

The National Association for the Study and Prevention of Tuberculosis

1910–1911

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105 East 22d Street
NEW YORK

The National Association for the Study and Prevention of Tuberculosis

1911–1912

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Dr. Gerald B. Webb, Colorado Springs

TABLE OF CONTENTS

	PAGE
Report of Meeting	11
Report of the Treasurer	14
Address of the President, by William H. Welch, M.D.	17
Report of the Executive Secretary, by Livingston Farrand, M.D.	29
Dr. Edward G. Janeway, Late President of the National Association for the Study and Prevention of Tuberculosis; His Contributions and Activities, by S. Adolphus Knopf, M.D.	34
The Responsibility of the State in the Tuberculosis Problem, by Homer Folks, LL.D.	44
The Responsibility of the County in the Tuberculosis Problem, by Hoyt E. Dearholt, M.D.	49
The Responsibility of the City in the Tuberculosis Problem, by Clyde E. Ford, M.D.	53
Open-air Schools, by Leonard P. Ayres, Ph.D.	77
Four Months in the Open Air—A Study of Sixty Children, by O. W. McMichael, M.D.	84
Methods of School Ventilation (By the Chicago Commission on Ventilation), by W. A. Evans, M.D.	92
Health of School Children, by Helen Marsh Wixson	95
School Health and Hygiene Exhibits, by John B. Hawes, 2d, M.D.	102
The Relief of Families in Which There is Tuberculosis, by H. Wirt Steele	110
The Past and Future of the Tuberculosis Nurse, by Edna L. Foley	120
Tuberculosis as a Factor in the Increased Cost of Living, by Edward F. McSweeney	131
An Economic Study of 500 Consumptives Treated in the Boston Consumptives' Hospital, by Edwin A. Locke, M.D., and Cleaveland Floyd, M.D.	148
A Survey of Dunn County, Wisconsin, by Hoyt E. Dearholt, M.D.	157
A County Organized and Equipped to Control Tuberculosis, by George J. Nelbach	170
The Control of Tuberculosis in the Smaller Towns, by George R. Pogue, M.D.	179
A Study of Three Small Cities, by J. Byron Deacon	183
Report of Traveling Tuberculosis Car of Missouri Association for the Relief and Control of Tuberculosis, by Miss Winifred Doyle	191
Boston's Hospital School for Tuberculous Children, by Edwin A. Locke, M.D., and Timothy J. Murphy, M.D.	199
The Present Attitude Toward Climate, by Alexius M. Forster, M.D.	212
Experience with Pulmonary Tuberculosis During the Past Year—A Clinical Résumé, by S. G. Bonney, M.D.	235
The Albumin Reaction in the Sputum in Pulmonary Tuberculosis, by Lawrason Brown, M.D., and W. H. Ross, M.D.	260
Sputum Examinations with Special Reference to the Antiformin Method, by Frederick Tice, M.D.	266
Bedside Service in Tuberculosis, by William Porter, M.D.	273

PAGE

The Treatment of the Secondary Anemia of Tuberculosis by the Hypodermic Injection of Iron, by Le Roy S. Peters, M.D., and E. S. Bullock, M.D. 291
Hypotension and Tachycardia in the Tuberculous, by John Ritter, M.D. 297
Studies on Mixed Infection in Pulmonary Tuberculosis. The Isolation of the Streptococcus and Pneumococcus from the Blood, by Roswell T. Pettit, M.D. 310
Secondary Infections in Pulmonary Tuberculosis (A Study Based on Sputum Examinations), by James L. Whitney, M.D. 318
The Effect of Tuberculin Treatment upon the Leukocytic Picture, by Myer Solis-Cohen, M.D., and Albert Strickler, M.D. 324
Prognosis in Pulmonary Tuberculosis, by H. S. Mathewson, M.D. 335
Report of 34 Cases of Tuberculosis Treated with Tuberculins and 18 with Mercury at the Marine-Hospital Sanatorium, Fort Stanton, N. M., by L. D. Fricks, M.D., William Keiller, M.D., F. Simpson, M.D., and F. C. Smith, M.D. 338
Investigations into the Nature of Tuberculin Sensitiveness, by Edward R. Baldwin, M.D. 351
Control of Bovine Tuberculosis, by Mazÿck P. Ravenel, M.D. 358
The Specific Tissue Inoculation of Vaccines, by Gerald B. Webb, M.D., and G. Burton Gilbert, M.D. 375
A Study of Leukocytes in 100 Cases of Pulmonary Tuberculosis, by Henry D. Chadwick, M.D., and Roy Morgan, M.D. 386
Some Remarks on the Mode of Infection and of Dissemination of Tuberculosis in Man Based on Anatomical Investigation, by William Ophüls, M.D. 394
The National Association for the Study and Prevention of Tuberculosis, Constitution and By-Laws 413
Geographical List of Members 419

Index 467

SEVENTH ANNUAL MEETING

OF THE

National Association for the Study and Prevention of Tuberculosis

THE Seventh Annual Meeting of The National Association for the Study and Prevention of Tuberculosis was held at the Brown Palace Hotel, Denver, Colorado, on June 20 and 21, 1911.

The Colorado members entertained the Association at luncheon on June 20th and also acted as hosts on the occasion of a mountain trip over the Moffat Road on the afternoon and evening of June 21st.

On Thursday, the 22d, many of the members visited Colorado Springs as guests of that city and had an opportunity of inspecting the various sanatoria of the vicinity.

The President of the Association, Dr. William H. Welch, called the Association to order on the morning of June 20th. Following the address of the President and the report of the Executive Secretary, in accordance with the regular procedure of the Association, the following committee was appointed by the chair to present nominations to fill vacancies on the Board of Directors.

Dr. Henry M. Bracken, St. Paul, *Chairman*
Dr. Dunning S. Wilson, Louisville
Mr. H. Wirt Steele, Baltimore
Dr. R. W. Corwin, Pueblo
Dr. Ethan A. Gray, Chicago

The following Committee on Resolutions was also appointed by the chair:

Dr. S. Adolphus Knopf, New York, *Chairman*
Dr. Mazÿck P. Ravenel, Madison
Mr. Frank E. Wing, Chicago
Mr. J. Byron Deacon, Philadelphia
Dr. Will Howard Swan, Colorado Springs

At the regular business meeting of the Association held on the evening of Tuesday, June 20th, the following members were unanimously elected directors of the Association for terms of five years.

Dr. Joseph S. Ames, Baltimore
Miss Kate Barnard, Oklahoma City
Mr. Ernest P. Bicknell, Washington
Dr. Vincent Y. Bowditch, Boston
Dr. John S. Fulton, Baltimore
Dr. Charles Lyman Greene, St. Paul
Dr. Elmer E. Heg, Seattle
Dr. Henry Barton Jacobs, Baltimore
Dr. Theodore B. Sachs, Chicago
Dr. Thomas D. Tuttle, Helena
Dr. Gerald B. Webb, Colorado Springs
Dr. William Charles White, Pittsburgh

Dr. James Alexander Miller, New York, was elected a director to fill the unexpired term of the late Dr. Edward G. Janeway.

The following resolutions were reported favorably by the Committee on Resolutions, and were unanimously adopted by the Association:

WHEREAS, It has pleased Divine Providence to remove from our midst our late President, Dr. Edward G. Janeway, and

WHEREAS, By his great diagnostic skill, and deep interest in all that appertains to the anti-tuberculosis movement in this country, he has been of invaluable service to our cause; be it

Resolved, That we the members of The National Association for the Study and Prevention of Tuberculosis deeply deplore the loss of our late President, who by his life and devotion to anti-tuberculosis work, should forever be an example for us to follow. Be it further

Resolved, That a copy of these resolutions be spread on the minutes of the Annual Meeting of the National Association for the Study and Prevention of Tuberculosis, that a copy of them be transmitted by the Executive Secretary to the family of the late Dr. Janeway, and also to the medical and lay press.

WHEREAS, It has been demonstrated experimentally by bacteriologists of high standing in this and other countries and by two governmental commissions, that the bovine tubercle bacillus causes serious and fatal tuberculosis in human beings; and

WHEREAS, Milk from tuberculous cattle appears to be the medium through which transmission of bovine tuberculosis to human beings most commonly takes place; be it

Resolved, That the National Association for the Study and Prevention of Tuberculosis recognizes the danger to mankind from tuberculosis of cattle; and be it

Resolved, That this Association recommends that all cows furnishing milk for human consumption be subjected to the tuberculin test, and that all animals which react to this test be excluded from dairy herds; and be it further

Resolved, That where these measures cannot be efficiently carried out, the Association recommends the efficient pasteurization of milk as a safeguard against the transmission of bovine tuberculosis to mankind.

WHEREAS, The care of advanced cases of tuberculosis has been found from experience to be particularly difficult in institutions located at a considerable distance from the homes of patients; and

WHEREAS, The municipality and the county have in most cases been found to be satisfactory units for the care of advanced cases; and

WHEREAS, The stamping out of tuberculosis depends so largely upon segregation of advanced cases; therefore, be it

Resolved, That The National Association for the Study and Prevention of Tuberculosis approves a plan whereby municipalities and counties shall be encouraged to erect satisfactory institutions for treatment of advanced cases; and be it further

Resolved, That this Association approves a plan whereby municipalities and counties shall be encouraged to establish dispensaries for the discovery, treatment and prevention of cases of tuberculosis.

WHEREAS, The National Association for the Study and Prevention of Tuberculosis has enjoyed the bountiful hospitality of the Colorado members of the Association, be it

Resolved, That we hereby tender to the chairman and members of the various committees, to the Colorado medical profession and to the laity at large who have so liberally contributed to our entertainment, our most hearty thanks and appreciation.

At a meeting of the Board of Directors held on Wednesday, June 21st, the following officers were elected for the ensuing year:

Dr. Mazÿck P. Ravenel, *President*
Mr. John M. Glenn, New York } *Vice-Presidents*
Dr. G. Walter Holden, Denver }
Dr. Henry Barton Jacobs, Baltimore, *Secretary*
Gen. George M. Sternberg, Washington, *Treasurer*

The following directors were elected to serve on the Executive Committee for the ensuing year:

Mr. William Baldwin, Washington
Dr. Herman M. Biggs, New York
Mr. Edward T. Devine, New York
Dr. S. A. Knopf, New York
Dr. George M. Kober, Washington
Dr. Walter R. Steiner, Hartford
Dr. William Charles White, Pittsburgh

Following the meeting of the Advisory Council on the evening of June 20th, Dr. Charles O. Probst of Columbus, Ohio, was unanimously elected Chairman of the Advisory Council for the next annual meeting.

REPORT OF THE TREASURER

Dr.

To balance on hand April 30, 1910	$521.14	
" membership dues	8,665.00	
" donations	1,273.10	
" appropriation from Russell Sage Foundation	20,250.00	
" sale of lantern slides	324.30	
" sale of cuts, photographs, electrotypes, etc.	43.49	
" payments for local exhibitions	1,125.71	
" payments for posters	281.28	
" sale of Transactions, reprints, etc.	372.62	
" refund of money expended	410.44	
" advertisements in Tuberculosis Directory	290.00	
" refund of check	10.75	
" interest	33.90	
		$33,601.73

Cr.

By expenditures for		
Rent	$1,485.96	
Salaries	14,766.45	
Executive Office	3,148.50	
Expenses of Bureau of Publicity	3,145.47	
Expenses of Bureau of Construction	1,528.19	
Printing and stationery	2,807.58	
Subscriptions to "Outdoor Life"	1,697.86	
Furniture and office equipment	41.75	
Expenses of exhibitions	1,720.00	
Reporting of Sixth Annual Meeting	162.50	
Expenses of annual meeting	17.50	
Storage	178.37	
Refund of checks	23.50	
Delivery of Transactions	39.54	
Auditing accounts	16.50	
Reprints	45.65	
Clerical assistance	111.15	
Dues to International Association	122.13	
		$31,058.60
Balance on hand April 30, 1911		$2,543.13

George M. Sternberg,
Treasurer.

New York, June 5, 1911.

The National Association for the Study and Prevention of Tuberculosis,
105 East 22d Street, New York.

Dear Sirs: In accordance with the request of Dr. Livingston Farrand, Executive Secretary, we have made an audit of the Cash account of the Treasurer of your Association, for the year ended April 30, 1911.

The following is a correct summary of the cash transactions for the year as recorded in the Cash Book:

Balance, May 1, 1910	$521.14
Receipts	33,080.59
Total	$33,601.73
Disbursements	31,058.60
Balance, April 30, 1911	$2,543.13

Yours truly,
(Signed) Haskins & Sells
Certified Public Accountants.

EXECUTIVE OFFICE ACCOUNT

Dr.		
To balance on hand April 30, 1910	$246.51	
" received from Treasurer	3,148.50	
		$3,395.01
Cr.		
By expenditures for		
Clerical assistance	$2,176.07	
Postage and telegrams	412.84	
Express, freight, etc.	48.00	
Stationery and office supplies	72.00	
Office care and repairs	39.20	
Telephone	198.42	
Car-fare and incidentals	2.80	
Traveling expenses	254.10	
Circulars, Reprints, Cuts, etc.	37.15	
Advertisement	3.00	
Storage	14.00	
		$3,257.58
Balance on hand, April 30, 1911		$137.43

We have examined the accounts of the Treasurer and Executive Secretary and find them correct.

John L. Dawson
Mazÿck P. Ravenel } *Auditing Committee.*

Contributors to the funds of the Association for 1910–11 were:

Mr. John D. Rockefeller
Mrs. J. Malcolm Forbes
Mr. William F. Cochran
Mr. William Beatty
Mr. H. L. Gregg
Mr. John Scarborough
Mrs. C. Alexander
Bonwit, Teller & Co.
Miss A. B. Loehr
Anonymous

ADDRESS OF THE PRESIDENT

THE SIGNIFICANCE OF THE GREAT FREQUENCY OF TUBERCULOUS INFECTION IN EARLY LIFE FOR PREVENTION OF THE DISEASE

By William H. Welch, M.D., LL.D.

Baltimore

Permit me, in behalf of the members of the Association, to extend a welcome to all our guests; also to express our gratification at this opportunity of meeting in the city of Denver. The custom of the Association as a national organization has been to meet in the city of Washington. There has been only one exception to this rule in the past, namely, the meeting held in 1908 in the city of Chicago, for which there were special reasons. This meeting, therefore, marks a departure from our precedents, but one which, I think, is to be welcomed. I believe the influence of the Association will be extended by meeting occasionally, say once in three or four years, outside of the city of Washington. While it is important to preserve the national character of the Association, it is likewise important to extend the influence of the Association and its benefits by occasional meetings in different parts of the country.

With peculiar satisfaction I express our pleasure in meeting in this city, which has been so actively identified with the anti-tuberculosis movement. We shall certainly feel well repaid if this meeting is a help in any way to the great cause in which we are engaged, and I am confident that the Association itself will derive great advantage from meeting in this place. We have experienced already enough of hospitality and of the excellent arrangements for our meeting to justify me in expressing even now our thanks to the committee of arrangements and to all who have coöperated with them.

Since our last meeting, my predecessor in this office, Dr. Edward G. Janeway, has passed away, and it is fitting that we should pay our tribute to the memory of this great physician, who enjoyed to an unusual degree the confidence and esteem of all his colleagues, and was one of the most influential and useful men who have adorned the profession of medicine in

America. His remarkable powers as a diagnostician, which to some seemed almost intuitive, rested upon long years of training, the first fifteen years of his professional life being devoted largely to that combination of work in the deadhouse with close observation in the hospital wards which has been the basis of the diagnostic skill of so many famous physicians.

Dr. Janeway was interested greatly in the subject of tuberculosis and in the movement to which we are committed. Dr. Knopf has kindly furnished me with data which I hope he will embody in an article pointing out many of the specific contributions of Dr. Janeway to the subject of tuberculosis. He and Dr. Austin Flint, the elder, were among the first in this country to recognize the significance of Koch's discovery in 1882 of the tubercle bacillus. Even shortly before that he published a paper on the contagiousness of pulmonary tuberculosis. It is rather difficult to trace all the contributions of Dr. Janeway through his published writings. For this purpose it is necessary to go through the reports of societies, and especially the discussions in societies. He made a large number of reports to the New York Pathological Society. Without exhaustive search I have counted not less than seventy published contributions of Dr. Janeway, a record which, while not prolific, is certainly not sterile, when one considers the value of his papers.

The great work of the New York City Board of Health in initiating the municipal control of tuberculosis, with which a former president of this Association, Dr. Hermann Biggs, has been so actively identified, received from the beginning the active and influential support and advice of Dr. Janeway. He was prominent in the work of the Committee on the Prevention of Tuberculosis of the Charity Organization Society of the City of New York, and of that of the New York State Charities Aid Association. He was much sought for as a member of committees, for the voice of no medical man carried greater weight with the public.

I shall ask the audience to rise in respect to the memory of Dr. Janeway.

Shortly after our meeting last year, early in May, there died Robert Koch, to whose great discoveries is due the movement against tuberculosis which was the occasion for the organization of this Association and to which our presence here today is due.

The name of Robert Koch is immortal in the history of medicine. He was endowed with the divine genius for scientific discovery, and was undoubtedly one of the greatest benefactors of his kind who has ever lived. We have only begun to reap the benefits to be derived from his discoveries. Generation after generation will continue to glean the harvest.

The real significance of Koch's work is that he gave us the key which enables us to unlock the secrets of that class of diseases, the infectious, which are of the greatest racial and social significance to mankind, whereby medicine, and especially preventive medicine, has been revolutionized. Medicine has come into relation with the problems of society in a way never before approached, and has a part to play of the highest significance for human welfare.

The greatest of Koch's discoveries is that of the tubercle bacillus, announced in 1882, not quite three decades ago. Not even Koch himself, far less others, could foresee all the beneficial results which would flow from this discovery, nor can we realize it all today.

Koch's interest in the subject of tuberculosis was paramount. He not only introduced the methods which enable us to learn the mode of origin and spread of this disease, but he continued, for over thirty years, a leader in investigation in this field. It is rare that a man opens the path and at the same time enters in and reaps such a rich harvest as Koch did.

Koch's discovery and study of tuberculin, while at first arousing hopes destined to disappointment, have proved to be of vast significance, not merely in their practical bearings, but in elucidating many problems connected with tuberculosis and other infections. I need in this connection only remind you of the interest which now attaches to the subject of hypersusceptibility or anaphylaxis, of which the tuberculin reaction is an example.

Koch's pronouncement on the question of the relation of human to bovine tuberculosis, bitterly contested as it has been, has been of great service in advancing our knowledge of a subject of great practical as well as scientific importance. It may be doubted whether a voice less powerful than his could have arrested the attention of investigators and have led to such numerous and valuable investigations as those which are now bringing the opinions of scientific students into fair agreement as to the extent and character of the dangers to human beings from bovine tuberculosis.

We recall with especial gratification Professor Koch's visit to this country, and his participation in the International Congress on Tuberculosis in Washington in 1908, to which he gave such luster.

I would like to add a word about another important contributor to our knowledge of tuberculosis who has passed away more recently, namely, Professor Arloing, of Lyons, France. I speak of him particularly on account of the charming impression which he made upon all who met and heard him at the International Congress on Tuberculosis in Washington.

He was one of that agreeable and important group of French colleagues who honored us by their presence, and I feel that you will wish me to pay at least this tribute of a few words to the memory of one for whom we came to have great admiration, almost, I may say, affection, on account of his delightful personality. He is a real loss to the cause of tuberculosis, and especially to that in France. It is significant that in the city of Lyons, where he worked, in contrast with so many of the French cities, there has been a decided decline in the incidence and mortality from tuberculosis.

This Association has reason to feel much gratification at the work which it has done in the six years since it was started. While the general aims of the Association have been clear from the first, there has been no attempt to formulate a definite program. The effort has been to further the propaganda against tuberculosis in a national way, and to direct our energies in channels which, for the time being, seemed most promising, so far as the resources of the Association permitted. The effort has been to stir up general interest in the subject, and especially to aid and encourage local organized movements. When we consider the large number of associations against tuberculosis which have started during these years, numbering now, I believe, nearly five hundred, many in affiliation with our national body, and initiated through its efforts; when we regard the good that has been done by our traveling exhibits, going from place to place, accompanied with lecturers, and usually associated with public meetings stimulating the interest of physicians and the general public wherever they go; when we note the specific contributions in the Transactions of the Association, and the stimulating influences of our meetings, it is evident that the relatively small amount of money which we have had at our disposal has accomplished an immense amount of good. We have received generous contributions from individuals, and we have reason to be especially grateful to the Russell Sage Foundation, without whose generous aid our work would have been seriously curtailed.

We can look forward most hopefully to the continued and enlarged activities of this Association. You will all wish me, I am sure, in this connection to express our appreciation and thanks to our very energetic and able executive secretary, Dr. Farrand, who is really the one so largely responsible for it all, working with singular unselfishness, devotion, intelligence, and sympathy in this great cause.

There are so many topics which I should like to bring before the Association that I am somewhat embarrassed at attempting a selection. I should like to say one word, at least, with reference to the scientific basis of the

campaign against tuberculosis. It is, of course, self-evident that rational and effective measures of prevention against any infectious disease must be based upon as exact knowledge as possible concerning the modes of origin and of propagation of that disease, and it is because we have, at least, a measure and a saving measure of such knowledge relating to tuberculosis that we are engaged in the campaign, which is so full of hope, but no one would pretend that there are not before us many unsolved problems. No one would claim that our preventive measures could not be more effective, more economically concentrated, more intelligently directed, if a good many of these problems were solved. Did we know more precisely, for instance, the paths of infection; did we know the full significance of the almost universal infection with tubercle bacilli, at least in certain strata of the community, in the early years of life; did we know, in a word, a great deal more concerning the origin and spread and nature of the disease, we would certainly be better armed to fight this enemy. We should, therefore, always in this Association keep in mind the importance of having the scientific side represented, as is now done in our pathological and clinical sections, and our sociological brethren, whom we are glad to have with us, must bear with us at times in the presentation of subjects of somewhat special and technical interest, which they may not feel bear directly and immediately upon the campaign. On the other hand, the scientific members must welcome all the aid which those engaged in great social reforms can render. It is here in this Association, as it is in the whole movement, that all the forces of society must be coördinated, and the Association is fortunate in having secured the cohesion of all who are interested in the subject of tuberculosis, whatever may be the special line of interest and activity.

The important subject of the portals of entry and paths of infection for the tubercle bacillus is to be treated by Dr. Ophüls, the chairman of the Pathological Section.

I have referred to the work which has been done to determine the share of tubercle bacilli of bovine origin in causing human tuberculosis. There is now general agreement of opinion that bovine bacilli are negligible as a cause of pulmonary consumption, the only question left open being the possibility of the transformation of the bovine into the human type by prolonged survival in the human host, a view for which, at present, there is very little satisfactory evidence. When one considers that most of the cases of open tuberculosis, which are the chief source of danger in spreading the disease, are pulmonary infections, it is apparent that a good share of Koch's contention upon this subject has been substantiated.

There is no doubt, however, that Koch gave a somewhat misleading impression, and underestimated the risks of infection from bovine sources. Such infection plays a rôle by no means negligible in the tuberculosis of infancy and childhood, particularly in the scrofulous infections of lymphatic glands and of other parts, which are so common at that period of life. Our prophylactic measures, therefore, should not neglect the dangers of tuberculous infection from milk, although these dangers are far exceeded by the risks from human sources.

The most important contributions which have been made in recent years to the genesis and pathology of tuberculosis are those concerned with the study of tuberculous infection in infancy and childhood, and the interpretation of the bearings of such infection upon the manifestations of the disease, particularly upon pulmonary consumption, in later life. I wish more particularly to call your attention to some of the results of these investigations.

The first thorough investigation of the frequency of tuberculous infection in human beings was made by Nägeli and published in 1900. He found that 97 per cent. of adults examined at autopsy in Zürich showed either active, latent, or healed tuberculosis; in other words, that infection with the tubercle bacillus is practically universal by the time adult life is reached. That is, of course, not equivalent to saying that every one has or has had the disease, tuberculosis. It signifies merely that in the class examined practically every one had received into the body tubercle bacilli, and that these had left their record behind. Nägeli's observations, startling as they seem, have been confirmed by similar methods elsewhere, notably by Burckhardt in Dresden.

Further studies have shown that in the great majority of cases this almost universal infection with tubercle bacilli in the classes examined dates from before the fourteenth year of age. This conclusion is based partly upon autopsies, especially of those tested during life with tuberculin, and partly upon the results of the testing of large numbers of infants and children for the tuberculin reaction by the harmless cutaneous and puncture methods. There is every reason to believe that a positive result of these delicate tests is certain evidence of an existing or healed tuberculous infection.

By means of data of this character it has been demonstrated by Hamburger and Monti that about 95 per cent. of all the children in the Vienna hospitals are already tuberculous by the time they reach the twelfth to the thirteenth year of life. Similar results have been obtained in Prague, and it is probable that they hold true for children of the poorer classes in

other large cities. While the percentage is doubtless considerably smaller for children of the well-to-do and in smaller towns and country places, the significance of the figures cited is scarcely diminished thereby, for it is especially to the poorer classes that our measures of prevention in the control of tuberculosis as a racial problem must be directed.

In considering this question of the frequency of tuberculosis we must, as already mentioned, keep clear in our minds the distinction between tuberculosis as a cause of death and tuberculosis as found, often only after long and patient search, as an accessory lesion in the inactive, latent, or healed forms. Regarded from this point of view, it is important to note that in the first weeks of life tuberculosis in any form and the positive tuberculin reaction are extremely uncommon. During the second half of the first year of life the number of cases increases, and in the second year they are no longer uncommon, and when the infection is found at this period, it is usually as the cause of death, most frequently as a tuberculous meningitis or acute miliary tuberculosis. After this period, up to the age of puberty, while the percentage of cases increases year by year, reaching over 90 per cent. by this time, the infection appears more and more frequently as an inactive or healed lesion, fatal tuberculosis being relatively uncommon.

As has long been known, pulmonary consumption is rare in the first decade and a half of life, the prevailing forms of tuberculosis in the earlier years being tuberculous meningitis and acute miliary tuberculosis, and after the third or fourth years chronic lymphatic disease and affections of the bones and joints. It is not, however, justifiable to infer from the prevalence of these types that the primary infection has been through the alimentary canal, as in the vast majority of cases of tuberculosis in infancy and childhood there exists tuberculosis of the bronchial lymph-nodes, usually associated with a focus in the lungs.

In the light of these facts we must concede that von Behring was right in his statement that in the great majority of instances pulmonary consumption develops in an individual who has previously been infected with the tubercle bacillus, although he was in error in his view that the primary infection usually dates from the first year of life and is derived from the milk of tuberculous cows.

Much light has been thrown upon the significance of this startling frequency of primary tuberculous infection in early life, as regards its bearing upon the genesis of pulmonary phthisis, by the study of the influence of an existing tuberculosis upon renewed infection with tubercle bacilli.

Koch, in his first study of tuberculin, observed that a tuberculous guinea-pig behaves differently from a normal one when reinfected with tubercle bacilli. In the former the reaction is immediate and is followed by a local necrosis, ending in complete healing of the site of reinfection, unless the dose of bacilli be too large. This observation, comparatively neglected by subsequent experimenters, has been made the starting-point in the last few years of interesting experimental studies by Römer and Joseph, Hamburger, and others. That a measure of protection may be afforded by previous inoculations with tubercle bacilli was demonstrated experimentally by Trudeau in 1890.

On account of the high degree of susceptibility of guinea-pigs it requires special methods of inoculation and small doses of tubercle bacilli to demonstrate readily the protective influence of an existing tuberculous infection of limited extent to reinfection, but such demonstration has been conclusively brought by Römer and by Hamburger. Particularly impressive and convincing are Römer's experiments with the tuberculous reinfection of sheep, which more closely resemble man in their sensitiveness to tuberculin. These animals may be rendered by a localized tuberculosis completely insusceptible to the subsequent intravenous injection of quantities of bacilli which kill the control animals in a few weeks with generalized tuberculosis.

The condition which is present in these animals as the result of a localized tuberculous infection is that designated by von Pirquet as allergy, and is characterized at once by immunity and by hypersusceptibility, the former being manifest upon the introduction of small or moderate doses of tubercle bacilli, which are readily disposed of, and the latter by the death of the animal or rapid development of the disease when the doses are excessive. In both instances the reaction follows speedily the reinfection.

There would appear to be also significant differences in the character of the tuberculous lesions according as these are the result of a primary infection or of a reinfection. It has long been known that ulcerative pulmonary tuberculosis is rarely produced experimentally in animals, and the usual assumption has been that they are but little susceptible to this form of tuberculosis, so common in human beings, but this cannot be the complete explanation. In 1894 Prudden demonstrated to the Association of American Physicians genuine pulmonary phthisis in tuberculous rabbits subjected to secondary intratracheal streptococcus inoculations. Concurrent or mixed infections, however, are not necessary, as it has been shown by von Behring and others that phthisis can be induced by renewed inoculations with tubercle bacilli in animals already tuberculous. Reinfections from without

are not absolutely necessary, provided there exist the proper ratio between the degree of resistance of the animal and the number and virulence of the bacilli. Given this condition, a single inoculation, even in guinea-pigs, has been known to produce a progressive chronic tuberculosis, resembling phthisis in man, but here it may well be that there are repeated auto-inoculations, such as are assumed to occur in man in chronic progressive tuberculosis.

There is abundant evidence that human beings, as well as animals, are protected by slight or limited tuberculous infections, dating in the former, as has been stated, usually from childhood, against the effects of renewed inoculation with tubercle bacilli both from without the body and from within. It is by virtue of the alteration or allergy effected by the primary tuberculous infection that the subsequent entrance of tubercle bacilli from without or their distribution from the primary focus to other parts of the body leaves no record behind in the majority of cases, for it is impossible to suppose that the two or three old scars or foci of tuberculous infection usually found represent the only penetrations of bacilli into the body during the life-time of the individual.

Gratifying as is the recognition of the protective value of an existing tuberculous focus of limited extent, we must keep in view that there is another side to the shield, and that it is precisely upon the basis of the altered reaction resulting from a primary infection that pulmonary consumption develops. Here there are doubtless many factors concerned which require further clinical, anatomical, and experimental study before we shall reach a satisfactory understanding of the pathogenesis of pulmonary phthisis.

We are in the dark as to the relative frequency in the causation of pulmonary consumption of auto-inoculations from existing tuberculous foci or of reinfections from without, but in view of the difficulty of tracing sources of infection in individual cases it is important to learn that it is not necessary to have recourse to extraneous infections, and my own belief is that in many instances pulmonary consumption results from auto-inoculations from previously inactive or latent foci of tuberculosis in the lungs or bronchial glands, possibly in other parts of the body.

Furthermore, we lack precise information concerning the causes which determine the occurrence of pulmonary consumption as the result of reinfections. It is probable that in some instances the explanation is to be found in the massive doses of bacilli received into the lungs, or in their repeated introduction at short intervals of time, but it seems difficult for many

cases to dispense with the doctrine that the resistance of the individual is lowered as the result of unfavorable conditions of health and of living. There still remains room for appealing to the various factors which have so often been presented as influencing the disposition of the individual to tuberculosis.

Another question requiring investigation is whether immunity persists after complete disappearance of all tubercle bacilli from the body, and if so, how long? In view of the difficulty of making sure that there are no living bacilli in the body, the question is not easy to settle, but the evidence seems to be in favor of a return of susceptibility within a certain period after complete recovery.

Although analogies in medicine are dangerous, there is much which is suggestive in that which has often been drawn in recent years between tuberculosis and syphilis. In both diseases an existing infection affords protection from reinfections, and both are characterized by a remarkable "*Umstimmung*" of the system, or allergy, whereby primary infections pursue a course different from the later manifestations of the disease, which in both affections are marked by extensive caseous masses, with a greater tendency to liquefy and form cavities in tuberculosis than in syphilis. According to this analogy, pulmonary consumption would correspond to the late or tertiary lesions of syphilis. I do not think, however, that we are justified in pressing this analogy too far.

It hardly needs to be emphasized that the facts which I have briefly sketched have important bearings upon methods of prevention of tuberculosis, and must be taken into consideration in formulating the plan of campaign.

Perhaps the most important lesson is the necessity of protecting infants and children from infection with tubercle bacilli, so far as possible. It may perhaps have occurred to you that if, in so many instances, the primary tuberculous infection dating from early life be, as it has been called, a "beneficent vaccination," we should not be overanxious to prevent it. In reply to this argument it may be stated, in the first place, that experience indicates that we hardly need concern ourselves with this matter of securing protection. We are not likely to escape, if we would, the minimal tuberculous infections. "Am Ende bekommt jeder ein bischen Tuberkulose," as the old German physician said many years ago. The preventive vaccinations will take care of themselves.

On the other hand, as I have mentioned, the forms of tuberculosis which appear in the first two or three years of life are predominantly fatal

forms, and not innocuous vaccinations, and these surely we should do all in our power to prevent. Furthermore, there is much in support of the view that the ultimate fate of the individual as regards progressive tuberculosis, it may be later in life, depends largely upon the extent of the primary infection, which is itself related to the number and virulence of the bacilli received into the body.

In the light of our newer knowledge there is abundant reason for the ever-increasing emphasis placed upon the importance of attacking the problem of tuberculosis in the early years of life. The key-note is the segregation of patients with open tuberculosis, that is, in the main, the consumptives, so that they will not be the means of spreading the infection to other members of the family, especially to the children. In France much is done in the way of removal of children from homes where there is a consumptive member, but while this procedure is effective, and perhaps can be employed oftener in this country than is now customary, it is not likely to be widely applicable with us. The results of constructing tenements especially adapted for the home treatment of consumptives must await further trial before we are warranted in drawing conclusions as to the efficacy of this interesting experiment. Our main reliance, as has been so often urged before this Association, must be upon hospitals designed for the reception of advanced or open cases of tuberculosis, and it would appear that there is no other measure of equal importance in lessening the spread of the disease.

A further deduction from the newer views as to the pathogenesis of pulmonary consumption is the importance of preventing reinfections, whether extraneous or autogenous, and of maintaining and increasing the resistance to the effects of such reinfections. Here come into consideration not only the hospitals for the care of tuberculous patients, but all those procedures for the after-care of those who are able to resume work, but are so likely to relapse after return to previous conditions of living and work. Working farms and colonies for the tuberculous have an important place in the campaign against the disease.

I believe that no mistake is made in preaching the gospel of hygiene to increase resistance to tuberculosis. Even if it should appear that undue emphasis is laid upon measures of general hygiene as a special feature of the anti-tuberculosis crusade,—and I do not believe that such is the case,—the incidental benefits in furthering the cause of individual and public hygiene and the general improvement of the health of the people, derived from this part of the campaign, have been of incalculable value. It has

been, above all, the movement against tuberculosis which has taught the people the value to health of fresh air, of proper and sufficient food, of exercise and play, of well-ventilated and sanitary homes and work-shops, of shorter working hours, of a living wage, and other social reforms.

There has been, in the last half-century, and especially since the discovery of the tubercle bacillus, a notable, steadily increasing diminution in the amount of tuberculosis. The fact that this decline is not universal, and that where it has occurred it has been in varying degrees in different places, indicates conclusively that special causes have been operative in bringing it about. I believe that it can be shown that the reduction stands in relation to the character and efficiency of the activities directed against the disease, although there may be difficulty in assigning to each factor in these activities its precise share in the result. As is well known, Koch and Newsholme, after careful analyses of these factors, have reached the conclusion that the segregation of consumptives in hospitals far outweighs in preventive value all others.

The results which have already been obtained and the greater ones which we can reasonably expect to follow, both in the control of tuberculosis and in the improvement of the health and efficiency of the people, are full of encouragement to press forward with increasing zeal in this greatest task ever attempted in the domain of preventive medicine. As tuberculosis is a disease of society, it must be met by a combination of all the forces of society, and we may be assured that such combined efforts, intelligently directed and based upon accurate knowledge, will bring direct and indirect benefits to mankind far outweighing all the money and time and energy expended.

REPORT OF THE EXECUTIVE SECRETARY

By Livingston Farrand, M.D.

New York

The annual report of the Association continues to be a record of growth and expansion to a most encouraging degree. The momentum acquired by the campaign during the past six years has continued unabated, and has brought about results that are impressive when gathered for the purpose of a comprehensive survey.

The local educational campaigns of the National Association conducted by means of the traveling exhibits have again been centered in the South and West. Since the last report presented to the Association in May of last year the Southern Exhibition, under the direction of Mr. E. G. Routzahn, has operated successively in Raleigh, Winston-Salem and Durham, N. C., and in Knoxville, Tenn., and during the winter and spring just past has concentrated its efforts upon the State of Mississippi and neighboring districts. Exhibitions have been held in Jackson, Meridian, Columbus, and Natchez, Miss., and in Mobile, Ala.

The Western Exhibition, under the direction of Mr. Walter L. Cosper, completed its campaign in Arkansas with exhibits in Little Rock, Pine Bluff, Fort Smith, and Fayetteville. During the summer Mr. Cosper was occupied in following up the work which had been inaugurated in the cities visited by him in the previous year and a half, and later in the autumn proceeded to Utah, where local campaigns were conducted with success in Salt Lake City, Provo, Logan, and Ogden. From that State the exhibition was sent to Boise, Idaho, and thence to Butte, Mont., where one of the most successful campaigns in its career has just been closed.

We have now nearly completed the territory previously untouched by educational propaganda, either national, state, or local.

The general operations of the Association conducted from the Executive Office have also been pushed to the limit of our facilities. The work of the Publicity Bureau, under the direction of Dr. Philip P. Jacobs, has continued with unabated success. Thirty-two regular press bulletins have been issued

during the past year, together with a large number of extra bulletins on special subjects, and in furtherance of particular phases of the campaign. We are now supplying about 6500 papers with carefully prepared bulletins fortnightly.

From the reports that are gathered in the office it is calculated that the bulletins are being used regularly by from 1500 to 2000 papers. On a basis of an average circulation of 2000, regarded by experts as extremely low, there are reached from this source alone from 3,000,000 to 4,000,000 readers every two weeks. In addition to this standard service, regular bulletins are prepared and issued to the American Press Association and the Western Newspaper Union. These press associations, as well as the larger news associations of the country, particularly the Associated Press, the United Press, the International News Service, and the Publishers Press, have been most cordial in their coöperation with the National Association, and have extended every facility in circulating the information desired.

Magazines and periodicals of all types are also calling upon the Association to an increasing degree for tuberculosis information to be used in the preparation of special articles on this and other phases of public health.

One of the most encouraging results of this systematic press campaign has been the establishment of a number of State and local press services, carried out in some cases in coöperation with the National Association, and in other instances independently. This is the case in nearly thirty cities of the United States. The hearty coöperation of State and local organizations has been an indispensable factor in the extension of this service, since of the 6500 bulletins which are issued regularly by the National Association, nearly 5000 are distributed by our affiliated bodies in the different States and cities.

There should be noted also the increasing influence which the Association is having in other parts of the world. The press service is now distributed to centers in practically all civilized countries, and we are being called upon constantly for suggestions and advice in the organization of educational propaganda against tuberculosis.

Last year, for the first time, the National Association took an active part in furthering the sale of Red Cross Christmas Seals, our particular function being that of stimulating interest and securing added publicity. The campaign was begun formally in September, and continued until after the holidays. Eight regular press bulletins on the Christmas Seal movement were issued, besides a large number of special articles. Lantern slides were prepared, a moving picture story was prepared and placed on the market, and there resulted a stimulation of the sale in many localities throughout the

country and a large increase in the number of seals sold. It is a pleasure to acknowledge at this point the cordial coöperation of many of the large magazines and other advertising mediums in the granting of free advertising space. The cash value of this assistance would have amounted to over $50,000.

During the winter much time has been devoted to the preparation of the new Tuberculosis Directory, which has just been issued, and is now in the hands of such members as may have applied for it. The growth of the campaign recorded in that volume has been so great that it was found necessary to eliminate all descriptive material and include nothing more than the absolutely necessary details of information. Even with such ruthless abridgement a volume of 331 closely printed pages is the result, listing nearly 2000 anti-tuberculosis agencies.

In January last the first steps for a repetition of the Tuberculosis Day plan were taken. The name was changed from Tuberculosis Sunday to Tuberculosis Day, in order to avoid objections on ecclesiastical or denominational grounds, the event having proved the wisdom of the change. April 30th, or some day in the week preceding or following that date, was chosen, and while it is impossible to obtain accurate reports of the number of churches coöperating, the evidence is clear that the movement aroused more interest than the year before, and has proved again a very powerful factor in the educational work.

The study of tuberculosis mortality has been continued, and we expect to have available by the autumn carefully compiled records of deaths and death-rates in the principal cities of Massachusetts, New York, Connecticut, and New Jersey, compiled from all available sources, National, State, and local. The first result of such a tabulation is to call attention to the marked divergences between the different official reports, and we are now engaged upon a careful analysis of these discrepancies. It is hoped that we will soon be able to correlate the mortality reports with the activities of the anti-tuberculosis movements in the different States and cities under observation.

The information regarding sanatorium and hospital maintenance is now in tabulated form, and while not available for publication, is open to inspection to any who may desire to study it.

The Bureau of Hospital and Sanatorium Construction, under the direction of Dr. Thomas S. Carrington, has also developed to the limit of our facilities. Since the last report the National Association has coöperated in the planning and construction of over 30 institutions, and has given detailed advice and information in the case of nearly 100 more. Where possible,

personal inspection of proposed sites has been made, and advice given with regard to the plans and installation of the institutions in question.

The edition of the pamphlet published a year ago, entitled, "Some Plans and Suggestions for Housing Consumptives," having been entirely exhausted, it was found necessary to rewrite and enlarge that work, which has been done by Dr. Carrington. It has just appeared from the press and forms a book of 168 pages.

An edition of 10,000 copies of the small pamphlet prepared by the Bureau, entitled "Directions for Living and Sleeping in the Open Air," was received as a donation from the Metropolitan Life Insurance Company, and the pamphlets were quickly distributed in response to requests. Over 5000 of these pamphlets were sent in reply to personal letters from individuals in all parts of the United States. In addition to this an edition of 15,000 copies of the pamphlet was issued, of which over 10,000 have already been distributed.

According to the plan mentioned in the annual report of a year ago, the edition of 25,000 posters, donated by the Poster Printers' Association of the country, was distributed through local associations and displayed upon the billboards of the country by the Associated Bill Posters of the United States entirely free of charge.

It is again a privilege to express the Association's particular obligation to the Russell Sage Foundation, which has enabled us to continue our exhibition and publicity work during the year. The value of this support cannot be overestimated.

Special mention ought also to be made of the part which the revenues derived from Red Cross Christmas Seals have played in financing local campaigns in all parts of the country.

The membership of the Association remains approximately the same as it was a year ago. The number of members at the present time is 2223.

Turning to the growth of the general movement in the country, the figures continue to be impressive. A year ago it was stated that there were in the United States 431 associations for the prevention of tuberculosis, while today we are able to report the existence of 511 in active operation.

A year ago there were 286 special tuberculosis dispensaries in active service, while today there are 342 of which we have record.

Of special tuberculosis sanatoria and hospitals there were at the time of our last annual meeting 393 in existence, while today we have record of 422.

Of the beds provided by this number, our reports a year ago indicated the existence of 22,720, while today we have record of 26,360 beds for tuberculous patients.

Promising as this increase in national equipment may be, it is obvious that much remains to be done. It is probable that the next few years will see an unusually rapid increase in the number of hospital beds available in the country for tuberculous patients, and under our present circumstances it is from this phase of the equipment that we must look first for a reduction in the death-rate. Conservative judgment will not permit predictions as to a fall in the mortality curve in terms of years, but there are already signs in certain of our commonwealths where the campaign has been most active and institutional provision more adequate, that tuberculosis is reluctantly yielding to the specific attack upon it. If this interpretation be true, we are justified in looking forward to the next decade with renewed hope and confidence.

DR. EDWARD G. JANEWAY

Late President of the National Association for the Study and Prevention of Tuberculosis; His Contributions and Activities in behalf of the Anti-Tuberculosis Cause in the United States*

By S. Adolphus Knopf, M.D.

New York

Dr. Janeway's activity in the anti-tuberculosis field was greater than the seeming scarcity of his publications on tuberculosis would indicate. Among his first publications on the subject there are some of a very remarkable character, as, for example, one on the contagiousness of tuberculosis, published as far back as 1882, prior to Koch's discovery of the tubercle bacillus as the factor of contagion; and a second article, entitled "Danger of Errors in Diagnosis between Chronic Syphilitic Fever and Tuberculosis."

Professor Janeway was among the first American teachers who, after Koch's discovery, taught the value of the bacteriological examination of sputum as an important diagnostic means. The invaluable help he gave to the New York Health Department, and particularly to Dr. Biggs, in the latter's early struggles for municipal control of tuberculosis, is a matter of record, and it cannot be better illustrated than by quoting what Dr. Biggs said in a letter to me in reference to it: "Dr. Janeway was always one of our strongest and most unswerving supporters. Dr. Janeway and Dr. Prudden and Dr. Frank Foster were almost the only men prominent in medicine twenty-five years ago in New York city who actively supported the measures proposed and later adopted by the Department of Health for the restriction and prevention of tuberculosis. The first assurance of this effect came, I think, in 1887, when Dr. Bryant sent a letter to a number of prominent physicians in New York asking for advice as to the adoption of the recommendations which had been made to the board by Dr. Prudden, Dr. Loomis, and myself. From that date onward his attitude never changed,

* Prepared for appearance in the Transactions of the Seventh Annual Meeting of the National Association for the Study and Prevention of Tuberculosis.

and it was to him that I went more frequently, in the early days of my connection with the Department of Health, for advice and assistance, than to any other man in New York. Dr. Janeway, Dr. Bryant, and Dr. Prudden were the three men who have never been found wanting in support of any measures to improve the public health in New York city."

Dr. Janeway was one of the examining physicians of the Adirondack Cottage Sanitarium from 1895 to the time of his death, and he had likewise been connected with the Loomis Sanatorium since 1900 as a member of the medical board. Dr. King wrote as follows in connection with his work there: "Dr. Janeway was a strong friend of the institution, following closely its work and methods, and was always one of my most valued advisers, both personally and in my capacity as the physician-in-chief at Loomis. I am glad that his contribution to the anti-tuberculosis movement is going to be suitably recognized."

Dr. Janeway was one of the consulting staff of the Sea Breeze Sanatorium for tuberculous joint diseases from the very start of the institution, and he likewise was a member of the advisory board of the Stony Wold Sanatorium for tuberculous working-girls and children.

In 1901 Dr. Janeway was one of the official delegates and honorary vice-presidents of the British Congress on Tuberculosis. In an interesting paper read before the Academy of Medicine on December 19th of that year he gave a very complete review of the work of that congress, and made some valuable suggestions concerning prophylactic measures. At the International Tuberculosis Congress in Washington in 1908 he was a vice-president of the clinical section.

In 1902 Dr. Janeway was one of the first to sign a call for the formation of a local tuberculosis committee, which developed into the permanent Tuberculosis Committee of the Charity Organization Society, on which he served as one of the most faithful and active members during the remainder of his life. He was likewise one of the first to join the National Association for the Study and Prevention of Tuberculosis, of which he became a director and member of the Executive Committee in 1906 and president in 1909. He was also a member of the Committee on the Prevention of Tuberculosis of the State Charities Aid Association from the time of its formation in 1907.

Dr. Janeway's interest in the consumptive poor and the down-trodden has been manifested on more than one occasion. When, in the early part of 1902, the Treasury Department of the United States, upon the recommendation of the Surgeon-General of the Marine Hospital Service, decided

to classify pulmonary tuberculosis with dangerous contagious diseases, the following resolutions were submitted to the Academy of Medicine:

WHEREAS, The Treasury Department of the United States, upon recommendation of the Surgeon-General of the Marine Hospital Service, has recently decided to classify pulmonary tuberculosis with dangerous contagious diseases, Be it

Resolved, That the New York Academy of Medicine deeply deplores this decision, which is not based on either clinical experience or on scientific experiments. Be it further

Resolved, That the Academy considers the exclusion of non-pauper tuberculous immigrants or consumptive aliens visiting our shores unwise, inhumane, and contrary to the dictates of justice. Be it further

Resolved, That while the Academy is convinced of the communicability of tuberculosis and urges all possible precautions against the spread of the disease occasioned by sputum and tuberculous food, the Academy is opposed to all measures by which needless hardship is imposed upon the consumptive individual, his family, and his physician.

It was due to Dr. Janeway, who seconded these resolutions in his usual quiet, dignified, but forcible and convincing way, that they were adopted unanimously at the Academy's regular meeting, February 6, 1902, with the recommendation to send a copy to the Treasury Department, the surgeon-general of the Marine Hospital Service, and the secretary of the New York State Medical Society.

Dr. Janeway was opposed to the unfortunate Goodsell-Bedell law, which made the establishment of sanatoria in the State of New York virtually impossible for a number of years, and, as a member of the various tuberculosis committees, helped in its ultimate repeal.

Dr. Janeway's indignation was aroused when, in August, 1903, a certain article appeared in the New York Medical Journal which was entitled "Psychical Relations of Tuberculosis in Fact and Fiction," in which the following statements were made, quoting another author who had found a number of patients disregarding his orders concerning the care of their expectoration, and having observed one who had expressed the wish that his young wife should not survive him, the writer of this sensational contribution said the following: "To me this account shows the germination of a homicidal tendency, which is the resultant of the psychical defects that I have outlined in my analysis of the average consumptive's mental peculiarities. Here, psychasthenia, the loss of self-control, and the rise of brutal selfishness have combined to distort the clearness of ethical per-

ception." . . . . "The fundamental factors in the psychical makeup of the typical consumptive are the loss of self-control, the rise of brute selfishness, the increase of susceptibility to suggestion, to emotion, and to nervous irritation, and the tendency to rapid nervous and physical fatigue."

In view of the large experience Dr. Janeway had with tuberculous patients, he was asked to express his opinion on the subject for publication. Here is what he wrote: "I have not noticed any such tendency as you inquire about on the part of consumptives as regards immorality or crime as compared with well people or with those ill with other diseases, placed under similar circumstances. It is to be remembered that criminals and the insane are prone to be victims of tuberculosis, and hence some one who studied this class of people would be liable to form very unjust views about the consumptive class as a whole. Nor is it my experience that the average consumptive is inclined to brute selfishness, loss of self-control, and hence distortion of the clearness of ethical perception. I have found so much to the contrary that I am surprised at so broad a charge against the consumptive invalid."

At last year's meeting of the National Association for the Study and Prevention of Tuberculosis in Washington I thought that because of some new peculiar official manifestation of phthisiophilia and phthisiophobia in certain sections of our country it would be very apropos to write a few words in defense of the consumptive. In preparing this paper, entitled "State Phthisiophilia and State Phthisiophobia," it was to Dr. Janeway that I went for advice and help. In the State of Nebraska a law had been passed regarding the establishment and management of sanatoria and hospitals for consumptives and care of the indigent tuberculous, which contained, among others, the following clause: "Provided, further, that it is made obligatory for any such hospital or sanatorium to use the modern treatment of immunization (vaccine therapy) in addition to open air and other sanitary methods." To learn the opinion of the masters of medical science in this country on the subject I sent out a letter of inquiry which read as follows: "Do you believe that the studies, experiments, and achievements in tuberculous immunization, tuberculous vaccine, or serum therapy, up to this date, entitle any federal, State, or municipal legislature to make immunization or vaccine therapy obligatory in cases of patients who, because of their poverty, had been obliged to enter a federal, State, or municipal institution for treatment and care?" In answer to this Dr. Janeway gave a most emphatic *No!*

His indignation and sound judgment were likewise manifested against

the action of the State Board of Medical Examiners of Oklahoma, which excludes tuberculous but otherwise well-qualified practitioners from practising in that State, and forces them to sign a sworn statement saying that they have not in the last three years lived in the house with or nursed any one suffering from said disease (tuberculosis). The following is what Dr. Janeway wrote on this subject: "I think that it is a very oppressive measure, and one not either humane or just. As regards the affidavit, I think that is an additional oppression, especially the part which requires the practitioner to say 'he has not lived in the house with a consumptive or nursed any one suffering from the disease.' These measures, it seems to me, are ill calculated to advance the best interests of the struggle against tuberculosis."

This was one of the last messages on tuberculosis he gave to the world, aside from his presidential address of 1910, in which he reviewed the medical and sanitary progress which had been made during the past decade. This far-seeing physician, teacher, and lover of his kind again warned us not to slacken our efforts on behalf of the betterment of the social and living conditions of the poor, and he wisely said, in the conclusion of his address: "The contest will not be considered carried to the highest point unless at the same time measures are taken to secure the avoidance of overcrowding, by the obtaining of suitable dwelling-places for the masses."

Dr. Janeway's tact, diagnostic skill, and wisdom in dealing with the consumptive individual, the many physicians who were or thought themselves afflicted with tuberculosis who went to him for an opinion, and the great number of general practitioners who sought his counsel, will never be forgotten by those who were fortunate enough to come in contact with him. Edward G. Janeway never claimed to be a tuberculosis specialist, but there is hardly any one who may aspire to this title who has done more for the anti-tuberculosis cause in general and for the individual patient or pupil, as a teacher, physician, or friend.

ADVISORY COUNCIL

Chairman

WILLIAM CHARLES WHITE, M.D.

Pittsburgh

OFFICIAL RESPONSIBILITY IN THE TUBERCULOSIS PROBLEM, THE STATE, THE COUNTY, AND THE CITY

The Chairman: After unprecedented activity in a public health movement we have arrived at a period in tuberculosis work where it is wise to clear away some of the froth and ask ourselves, pointedly, two questions:

Is our present method the most economic plan?

Is our present method the most efficient plan?

One thing is clear: no plan of control of tuberculosis can be efficient that is not based on law which is alone resident in federal, State, county, and municipal government. It is, therefore, a most gratifying thing to find this desirable factor being so rapidly grafted upon the movement started by voluntary philanthropic organizations.

From the nature of our present division of power the federal government is not likely to be a dominant factor in a malady which has its origin in the home, and which varies in importance somewhat directly as our populace becomes segregated in larger communities. This being the case, the first division of legal control is reached in the State government.

The most dominant feature of modern State government is paternalism, the antithesis of vogue of our forefathers, exemplified by Jeremy Bentham and Jefferson. For the sake of comparison allow me to specify this feature as maternalism.

Our States today, then, stand in their attitude to their children, the counties and municipalities, in much the same position as the modern mother.

There are those who pay little attention to their children in the matter of tuberculosis control.

There are those who do not see fit, because of wealth or for other reasons, to trust their children with any jurisdiction in the surveillance of tuberculosis.

There are those which, like New York and Ohio, while vouchsafing assistance, are dominated by a desire to make their progeny self-supporting and independent in the management of this malady.

To carry the simile further—there are States with small families and

States with large families. It is easier for the former to educate and provide for than for the latter.

These two factors make it almost impossible to lay down a plan of procedure which will fit all State conditions. In spite of this it seems possible to set forth an ideal condition, based on sound principle, which each State might modify for its own governance and for the guidance of its counties and municipalities.

Descending the scale of authority, we enter immediately the field of battle. In the county and municipality all the conflicts of actual control must be waged. The county is placed before the municipality to-night for two reasons: (1) Because it is the next division in size to the State; and (2) because it has been sadly neglected until the present year.

The efficiency of the work in the county is dependent upon three factors: (1) The character of the county health officer; (2) the extent of his power; and (3) the amount of money available.

In the county the great questions for decision are—

1. The division of labor, viz., who shall be responsible for education? who for the care of advanced cases? and who for the care of early cases?

2. How shall funds for this work be raised? *i. e.*, how much from State? how much from county? and how much from charity?

3. How shall the county's work be correlated with the general State work?

One thing is clear to me, however. Because tuberculosis is a home disease, there must be a local autonomy in that division of management which can reach the home, and this, I think, means county autonomy.

The last division of the State to be delegated with this power in tuberculosis work is the municipality. In many of the municipalities the work has been carried on with varying efficiency for a good number of years. The results of labor have been evidenced, and the great question now to settle is—How shall we secure a proper correlation of the three operating factors, State, municipality, and charity, so that waste shall be stopped and economy and efficiency attained?

Apart from New York, which has been the model of the world, there is but one city I know of that has approached the problem in the proper way. In Cleveland all factors are today centralized in a municipal control which has power to dominate and direct the movement for the whole municipality. The city has seen the necessity for utilizing and working in harmony with the greatest of all non-legal powers—*charity*.

There has been a gross negligence in the matter of municipal control for some years, in the fact that in attempting to educate we have in large part

neglected to educate that body of citizens which is directly responsible for the management of tuberculosis conditions. I refer to the education of the doctor himself. I know of only four cities today which have undertaken systematically to provide special courses, both from a social standpoint and from a medical standpoint, for the physicians in training, and also for nurses in training. In our general hospitals the almost constant habit of cutting off contagious portions from our hospitals will mean that in the future we will be unable to train both physicians and nurses in diseases which are of the first importance in the protection of public health. The four cities I know of which have already made good provision for teaching tuberculosis work are Baltimore, in the Phipps Dispensary, Philadelphia, in the Phipps Institute, Pittsburgh, in what is part also of a Phipps Institute, and Chicago. Dr. Billings has been recounting to me today some interesting features which have been carried out in the city of Chicago, in which there has been an endeavor to throw back into the hands of the physician, and into the hands also of the nurse, this problem of tuberculosis, by giving them sufficient instruction to enable us to have the support of these two professions.

THE RESPONSIBILITY OF THE STATE IN THE TUBERCULOSIS PROBLEM

By Homer Folks, LL.D.

New York

In most general terms the official responsibility of the State in the prevention of tuberculosis, as contrasted with counties, cities, and towns, is that the State's duty is either to do it itself, or to see that it is adequately done by the minor political subdivisions. The primary responsibility rests on the State. The powers and duties of the cities and counties are defined by the State.

In any decision as to which of the various responsibilities should be exercised directly by the State, and which should be imposed by the State upon counties and cities, due regard should be had to the general trend of legislation in each State, to institutions already established, and laws already enacted, and to the readiness with which considerable sums of money are to be had by the State and by the local political units respectively. General rules cannot be laid down, though certain general tendencies are fairly evident.

I. HOSPITAL PROVISION

The most important and the most difficult responsibility is that of providing hospital care. Since the International Congress at Washington, it is not necessary to dwell on the importance of hospital provision. Hospital provision is, however, far more expensive than any of the other factors in the tuberculosis campaign. In securing hospital provision, at least four different policies are to be considered:

(*a*) State hospitals, maintained wholly at the expense of the State, for incipient or advanced cases or both.

(*b*) State hospitals erected by the State, but the expense of maintenance of which is largely charged back on a per capita basis to the localities from which the patients come.

(*c*) County or city hospitals erected and maintained at local expense.

(*d*) County or city hospitals erected at local expense, but receiving a subsidy or a grant from the State toward the cost of maintenance.

Of these four possibilities, experience leads me to favor the development, in each State, of both the second and the fourth—State hospitals partly maintained by per capita charge against localities, and local hospitals locally maintained.

The arguments for State care of incipient cases include the desirability of change of climate from some portions of the State, greater efficiency of the State as an administrative unit, and the fact that in many localities the number of incipient cases recognized is so small that an efficient local sanatorium is not likely to be established. On the other hand, large cities should by no means be excluded from, or discouraged from, having their own sanatoria for incipient as well as other cases. New York city, for instance, has its own sanatorium at Otisville. It also sends its proportion of cases to the State hospitals for incipient cases in the Adirondacks. Complete State hospital provision for all cases, both incipient and advanced, would have much to commend it if it were practicable to secure it. It would insure greater uniformity and greater efficiency. It would not, however, tend in equal degree to arouse local interest, and it is doubtful if the State would distribute its hospitals sufficiently widely so as to be readily accessible to the patients, their friends, and their relatives. Practically, however, the difficulty of securing adequate appropriation from State funds for complete State provision is such that some form of local provision must be considered.

In New York we hesitated long between a series of municipal hospitals and a series of county hospitals, and decided in favor of the latter. The prevailing consideration was that in provision by the municipalities the large rural portions of the State would still remain unprovided for. The duty of the State clearly includes the enactment of a suitable statute under which the establishment of local hospitals on the most advantageous basis is encouraged. This statute should clearly define the method by which such hospitals are to be established, and the official responsibility of their management. It should completely sever them from all connection with pauper institutions and with poor law officials. In my judgment it is in most States inadvisable, as a rule, to require a referendum as to whether or not a hospital should be established.

The State has a further duty to perform in relation to these local hos-

pitals, whether they be municipal or county. It should, in my judgment, keep in the hands of its health department the approval of sites for such hospitals and the approval of plans, and should exercise an effective and frequent inspection of all such local hospitals. Under the most favorable circumstances it will be a matter of great difficulty to secure reasonably uniform and reasonably efficient management of a series of such local institutions. I believe, however, that it can be accomplished by a strong State supervision without imparing local control.

The plan of offering a subsidy from the State treasury to local hospitals is attractive to many. It holds out the possibility of encouraging local officials to act when otherwise they might remain quiescent, and it makes easier a more effective supervision by the State. The threat of withdrawing the State subsidy serves as an efficient lever in securing improved administration. My instinctive feeling, however, is against the confusion of responsibility involved in the granting of a subsidy from the State treasury to a series of local institutions. I doubt whether, in fact, it is possible, over a long series of years, to secure efficient local administration by this method. It seems to me, on the whole, wiser and more promising to leave the financial responsibility squarely on the shoulders of local officials, the State exercising only a supervisory power.

II. DISPENSARIES, VISITING NURSES, REGISTRATION, AND SANITARY OVERSIGHT OF HOMES

As to this important group of activities, I am very clearly of the opinion that the responsibility of the State should be, first, to pass legislation clearly defining the powers and duties of local health officers, giving them all necessary authority, and, in fact, imposing upon them the imperative duty of proceeding in an effective manner for the protection of the public health by the prevention of tuberculosis; and also that it is the duty of the State, through its State health department, to inspect and endeavor to standardize the work of local health officials, without depriving them of the responsibility for administrative control. While it would be possible for the State to maintain a series of dispensaries at its own expense and under its own direct oversight throughout the State, it seems to me clear that such dispensaries would be out of touch with local authorities and with the medical profession, and that the completest coöperation of officials and physicians is necessary for the effective handling of the situation. I would emphasize, however, the necessity for State inspection and coöperation.

As a rule, this should be, in my judgment, rather by way of furnishing information and by way of suggestion, than of command. Personally, I should be quite willing to make the appointment of local health officials subject to the approval of the State health department, but this would be unconstitutional under the present constitution of the State of New York. The power of removal of local health authorities who are incompetent, neglectful, or untrustworthy should be vested in the State health department. The power to make uniform regulations throughout the State for the protection of the public health, including the definition of the methods for the sanitary oversight of homes in which there is tuberculosis, may also wisely be imposed upon the State health department.

III. POPULAR EDUCATION

It is also entirely proper, in my judgment, for the State to carry on a movement of general popular education in all matters pertaining to the public health, including tuberculosis. Except in large cities, whatever the State may do in this respect is likely to receive more general attention and more general acceptance than that which is done by the local authorities. The State has greater prestige and employs more experts. It is apt to have greater continuity of administration and to be less subject to political and partizan influences. An educational campaign, carried on by the State, should, however, be carried on in the fullest coöperation with the local health authorities, and, so far as practicable, through them, and in such a way as to emphasize their position and strengthen their hold on public confidence and their ability to secure adequate appropriations. It would, no doubt, seem to be simpler and easier, perhaps, for the State to do those things itself directly and without regard to local officials. Taking a longer look ahead, however, I am confident that the slower method by which the State builds up effective local health authorities and assists them in improving the standard of methods of their work is wiser and will get further.

To sum up, then, it is the duty of the State to see that tuberculosis is prevented. It need not do all the work directly, but it should see to it that the work is done. The State may advantageously undertake the direct administration of sanatoria and a movement of popular education. It may devolve upon local authorities the establishment and maintenance of hospitals for moderate and advanced cases, and upon large municipalities also the maintenance of sanatoria. It should devolve upon local authorities the establishment of a system of registration and of sanitary super-

vision in households, the maintenance of dispensaries, the employment of visiting nurses, and a provision for special relief of families of tuberculous patients. Even when these duties have been imposed upon the local authorities, it still remains the imperative duty of the State to see that they are adequately and effectively performed, and to corect inequalities, excesses, or incompetency on the part of authorities of backward communities.

THE RESPONSIBILITY OF THE COUNTY IN THE TUBERCULOSIS PROBLEM

By Hoyt E. Dearholt, M.D.

Milwaukee, Wis.

It must be safe at this time to assume that the responsibility for the tuberculosis situation rests upon organized government, and that any disease affecting the lives and welfare of all the people, and in which the individual is so powerless to protect himself by any safeguards which he can erect unaided, must be a subject of coöperative management which is, in the final analysis, all that constitutes official government. Volunteer organizations are justified in assuming the functions of State only for the purpose of demonstration of practicability, or when intolerable conditions confront an unorganized people—such, for example, as those which made the organization of vigilance committees imperative among order-loving citizens in the early history of our western country.

My part, then, in this discussion is merely to emphasize the necessity of considering the county unit of administration as opposed to that of the established order. Tuberculosis is but one of the preventable diseases, and measures for its control find their only logical and final expression through general health administration.

It is a matter of common belief, the correctness of which the findings of our Dunn County investigation conclusively demonstrate, that the present system of health administration is utterly inadequate for the control of the spread of tuberculosis in rural sections. Nor is this strange when it is taken into account that in the State of Wisconsin, for example, one-half of the entire population is rural, and yet, as now constituted, our laws vaguely divide responsibility between the State and municipal boards of health. Were our country made up of commonwealths which, in turn, were divided into cities large enough to maintain departments such as are now to be found, unfortunately, in but one or two large cities, and were there no interurban dwellers, I would willingly concede that separate municipal units, closely supervised by a strong central authority, would be theoret-

ically correct, and that all that would be required radically would be a refinement of executive methods.

It has interested me to trace the origin and theory upon which our present thoroughly incompetent rural administration of the police power, which includes the control of public health, has come to be adopted, and from present indications bids fair to be perpetuated. I may, perhaps, be permitted, therefore, to go into a brief elementary and somewhat pedantic discussion of the theory and practice upon which the distribution of general administrative authority is based.

As our government is constituted in the United States, the sovereign power is vested, by the people from whom it ultimately arises, in the State or commonwealth government. The federal government obtained whatever power it possesses by specific grant of the original component States. By the same process the State has, within its borders, delegated its authority in the administration of local affairs to county, city, and village units. The authority thus vested in local governments is by individual grant through charters, which are in no wise uniform.

The State commonly reserves supreme authority and the right to inspect and to enforce compliance with a characteristic State standard in the regulation of its various police powers. The county, in turn, has, largely for convenience and expediency, in the administration of matters of purely local concern, such as straying of cattle, building and maintenance of neighborhood roads, and the regulation of petty infringements of peace and order, been subdivided into townships usually six miles square. Administration through the town unit has hitherto been fairly well suited to the needs of rural inhabitants. The general functions of rural local government are commonly held to be regulation of order, sanitation, poor relief, and education. As civilization has become more complex, town board administration seems to have been proved and accepted to be inadequate for all but one of these functions, namely, sanitation. Even the building and repair of roads and bridges, which at the present time constitute the chief function of the town boards, is gradually being assumed by more centralized authority. The country roads in the United States offer obvious evidence of economic waste and ridiculous inefficiency. While less obvious, rural public health administration is even more discreditable.

The necessity of better administration of justice, excepting for the most trivial offenses and disputes between neighbors involving property rights of small intrinsic value, led to the establishment of the county, which unit did not originally exist in the commonwealths of New England, whose

constitutions and laws have since served as models for the newer States. Supreme jurisdiction in the municipality is through the County Circuit Court, which is no less a State court.

A county officer, the sheriff, is responsible for the peace of the several municipalities which constitute the county, being the official through whom the State maintains its supreme authority over even large cities. The district attorney shares with the sheriff the enforcement of the State laws; it is his duty, in addition to being councilor to the county board, to prosecute infringements of all laws which have been enacted for the maintenance of a uniform standard of protection of personal and property rights, except the purely local regulations. The coroner also is a county official, and uniform probating of estates, guardianship of minors, mental incompetents, and dependent poor are secured through county jurisdiction.

The conduct of schools, while originally conceived to be of only local concern, has, in many States at least, been recognized, by the provision of county superintendents, as falling more properly under county jurisdiction.

Each of these county agents is answerable to the State, and may be removed on cause and a temporary appointment made by the Governor of the State to fill the vacancy.

In Wisconsin, which I think is a fairly representative State as regards provision of measures to control the spread of tuberculosis (it will be recalled here that Wisconsin was awarded the first prize for its laws at the International Congress on Tuberculosis), a jump is made from the State Board of Health to the municipal boards in execution of health regulations. Sanitation is the one important general function of local government which has been left to the town board, apparently upon the conception that the spread of contagious diseases, except in rare instances, is of only neighborhood concern. This is, in a measure, true of those contagious diseases of so acute a character that the patient is usually confined to his bed throughout a considerable portion of the period of contagiousness. Tuberculosis, however, because of its insidious onset and protracted course over a period in which the patient is almost unhampered by his illness from taking even long journeys, is the unruly member of the infectious disease group which cannot be fitted into the present system. True, other epidemics spread at times and become of more than purely neighborhood importance. These occasions, however, are so rare, and withal so startling, that they constitute an emergency. Even ordinarily incompetent officials are stirred by sudden calamities and emergencies to wonderful and prompt efficiency, and in

such extreme instances the State Board may be trusted to exercise its prerogative and take charge of the situation.

The township board of health seldom appoints a physician health officer, although this is recommended in the regulations of our own State Board of Health. As concrete evidence of the incompetency of rural health boards to deal with the tuberculosis problem the statement is offered that of the 22 townships which constitute Dunn County, the seat of our rural investigation, only two rural boards had complied with even so primitive a regulation as disinfection after death or other removal of a consumptive. Conversation with local health officers brought out the information that the very existence of such a mandate was generally unknown by the officials to whom the executive authority is delegated by the central State government.

I have attempted hitherto to suggest the necessity of considering the county unit of administration on the ground that it offers a logical and consistent division of authority. In addition, there is the practical consideration that, by following the vogue and dealing with a unit which the people are growing constantly to appreciate more and more, there will be less danger of side-tracking and greater opportunity of securing proper regulation through centralized authority than there is through a multiplicity of executive boards.

The proved need of a comprehensive and efficient machine for the control of the tuberculosis problem, not to consider other preventable disease, requires an extensive equipment, beyond the means of a rural township. A township, village, or small city could not economically provide an efficient executive health officer, devoting all his time to the work, home visiting, medical inspection of school-children, laboratories, educational literature, and the other accepted agencies. The county, on the other hand, is usually large enough to afford a comprehensive working health organization. A combination of two or more of the less populous counties should be permitted.

Modern industrial enterprises have given a practical demonstration that the greatest efficiency is secured with a minimum of expenditure through units neither so large as to prohibit close surveillance nor so small that they will be weighted down by overhead operating cost. Constantly bearing in mind the consideration that tuberculosis can no longer be regarded as any more an urban than a rural problem, the county unit seems to me to afford the best strategic position for concentrating official responsibility.

THE RESPONSIBILITY OF THE CITY IN THE TUBERCULOSIS PROBLEM

By Clyde E. Ford, M.D.

Cleveland

On the control of tuberculosis, as on all questions that profoundly affect mankind, the last word has not been said, and in the existing state of knowledge it is hopeless to expect anything like unanimous opinion. Latham and Garland say: "Consumption is much more than a mere malady. It is a disorder of social affairs—a source of heavy financial losses—a maker of national burdens. No longer can tuberculosis be regarded as disease—the study of which is to be restricted to members of the medical profession. This death-dealing social deranger and costly handicapper of human activities must be investigated and controlled in all its far-reaching influences. The problem is so vast that it has been attacked on many sides; each line of attack has attracted a group of workers who have become specialists in their own particular line, and who promulgate views with enthusiasm, and it is observed with the limitations of a specialist.

Sanatorium workers support their field. The dispensary worker is anxious to extend the dispensary system. Others place their hope in the improvement of the sanitary and social conditions of the people, and so on, etc.

While appreciating the value of general sanitary and social amelioration, one cannot fail to note the fact that more direct methods are required for the complete control of the disease. One must admit that too much has been made of the sanatorium in the past, but this does not necessarily mean that the sanatorium has no real value, because it has been an educative as well as a curative agency. As a means of cure, many sanatoria have suffered from the fact that they have been working as isolated agencies, and not as units in a well-rounded scheme. To discharge a patient who returns to the conditions in which he contracted the disease is a procedure which will scarcely prove beneficial to the patient or the community.

To conserve the welfare of both, the patient must be taught to live aright.

For home supervision of the patient and for the detection of early cases there is nothing so effective as the dispensary. The dispensary is a necessary complement of the sanatorium. The dispensary system best works in intimate association with the municipal authority, for which it is a tuberculosis directory in a given administration area. Its value may be indicated by the fact that in the city of Edinburgh 60 per cent. of all notifications to their health department are made by the dispensary. Again, the dispensary may work in association with the board of education on the principle and supervision of open-air schools. At the dispensary the latent stigmata of pulmonary tuberculosis are detected in the child. As stated by Sutherland, apart from those who are active cases, these former are the tuberculous seedlings, the potential advanced cases of the future, unless their resistance be raised under simple hygienic measures before they enter the critical age period of life. And for reasons of economy, the medical supervision of these open-air schools should be in relation to the dispensary, which is the agency that can detect the prospective case and deal with it in relation to the sources of infection.

The conclusion must be, then, that tuberculosis is an enemy so powerful that it must be attacked by many weapons, and what is necessary is the application of effective agencies in a closely coördinated, preventive scheme, and the controlling force of the scheme must come from the health department—this largely by reason of its necessary police power.

The tuberculosis problem is largely municipal, owing to the exigencies of urban life, and while it is true that the State should exercise its influences by enacting legislation, granting power to local health authorities, and standardizing the methods in a general way, it is questionable whether the time is ripe for uniform or hard fixed standards, for the reason that thought is not crystallized, and State Health Board executives are too frequently individuals whose tenure is by reason of their political acumen, hence are apt to adjust rather than enforce the law, or the board itself may be composed of non-progressive medical men not abreast in modern thought, unwilling to admit if it has occurred to them that the tuberculosis problem is a social one, medicine being but incidental.

There are many charitable organizations who, through their nursing and other activities, care for the tuberculous, in addition to the work done by the city and State, and these continually overlap in their work and fail in their effort, through lack of knowledge of what should be done and what

has been done, and thus render the return for money expended much less than it ought to be. If, then, there is in the Health Office of the city some clearing-house and registration of the care and conditions of each case of tuberculosis, much waste effort will be stopped.

Years ago Koch said that society must take three steps in combating tuberculosis, namely: Compulsory notification, compulsory disinfection, and compulsory segregation. You are familiar with the fact that the first requisite mentioned by Koch was strenuously opposed by the medical profession on the ground that the practice of its members would be interfered with and patients unnecessarily annoyed. However, due to the position taken by a number of broader medical men of the country, notably Biggs, of New York, Osler, Thayer, Welch, and others, Koch's idea was written into law, and the fears of physicians who lacked vision were not realized, and, instead of hardship, the notification laws have worked benefits, and but little opposition remains today. The fundamental importance of this measure is so evident that its consideration seems hardly necessary. It should be remembered that, as tuberculosis radically differs from the more readily communicable diseases, so the measures for its sanitary supervision must differ from the measures adopted for the latter. This fact should always be recognized by the health authorities in the enactment and enforcement of regulations relating to tuberculosis, and as a weapon of social defense it is unassailable.

The city cannot adequately handle this problem unless it has a form of stock-taking which will keep its health department conversant with the needs of expenditure and the provision for its handling the disease. It is manifestly illogical to undertake a campaign of any sort without first ascertaining the position of the enemy. Our hospitals, jails, and other public institutions of segregation are hotbeds of tuberculous infection. Our tenements and homes are the nests of infection, from which flows a continual stream of consumptives whose mode of life is without guidance or restriction. Children may go to school; adults go about, ride in public conveyances, or continue to work so long as "reasonable precautions" are adopted to prevent the spread of infection. If "reasonable precautions" be applied to cases of scarlet fever, diphtheria, and so on, one can readily foretell results.

A detailed plan, as proposed by Millet in a paper read before the Massachusetts Conference on Tuberculosis in 1910, contains much that is of value for municipal activity:

PLAN FOR AN AGGRESSIVE LOCAL CAMPAIGN AGAINST TUBERCULOSIS

Object.—To reduce to a minimum the number of cases of tuberculosis in Brockton.

Ideals.—Have the public intelligently informed as to ways of preventing and treating the disease.

Get in touch directly or indirectly with every case.

Be absolutely certain that every open case takes proper precautions.

Be absolutely certain that every closed case lives so as not to become an open one.

Isolate all advanced cases.

Seek out all incipient cases and place them under modern open-air treatment.

METHODS

The Dispensary.—Extend the work of the dispensary until the board of Health shall undertake this function.

Establish a nose and throat clinic.

Establish a dental clinic.

Establish an orthopedic clinic.

Extend the collateral examinations.

Continue the class in medical gymnastics.

Develop "class work" in connection with the clinic.

Develop a more complete supervision of the patients in their homes, with the assistance of the friendly visitors or paid workers and the Visiting Nurses' Association.

Obtain hospital accommodations for every case that needs it.

See that disinfection and cleansing after death or removal are thoroughly carried out.

The Elberfeld System.—Divide the city into districts and carefully investigate every case in each district. Also inspect in each district every factory, school, tenement-house, and store. (The size of the district should depend upon the number of cases known to exist in certain localities.)

Appoint a friendly visitor for each district, or secure a paid worker who shall do the work in conjunction with the general secretary. Whenever the work becomes too arduous for one visitor, subdivide the district.

Education.—Distribute a circular containing a simple statement of the few things necessary in the prevention and treatment of tuberculosis.

Carry on an active campaign which shall include talks before every society and club in the city.

Hold mothers' meetings.

Talk to the children in the schools.

Obtain a traveling tuberculosis exhibit especially illustrating local conditions, and keep it in motion.

Get employers to pay board of infected employees while at sanatoria.

Advertise the hours during which the clinics are held in pay-envelops and in other ways.

Municipal Action.—Bring effective influence to bear upon the city officials, in order that sufficient money be appropriated so that the board of health shall not be hampered in its fight against tuberculosis; that the board of health may carry on the tuberculosis dispensary; that a camp, a sanatorium, and a hospital combined may be established; that an outdoor school for tuberculous children may be conducted; and that a thorough and systematic inspection of the schools, factories, tenement-houses, and stores may be carried out.

Ask the school committee to have the children inspected for tuberculosis; or, at least, to have them weighed and measured, and to place all under-developed children in open-air rooms.

Methods of Finance.—Divide the citizens up into blocks of ten, and appoint for each block a collector who shall once a year approach these individuals for a contribution.

In the order of their importance, and in accord with conditions as they now exist in Cleveland, the following represent our ideas as to a coördinated plan for the control of tuberculosis, and in passing your attention will be drawn but briefly to the various activities indicated:

HEALTH DEPARTMENT

1. Registration—compulsory.
2. Education—lecture shows—experts.
3. Dispensaries—nurses.
4. Cleansing and disinfection.
5. Associated Charities—department of relief.
6. Hospitals for advanced cases.
7. Hospitals for incipient cases.
8. Tenement-house inspection.
9. Food and dairy inspection: Special attention to source of supply.
10. School inspection—contagious diseases.
11. Study of occupation diseases.

ANTI-TUBERCULOSIS LEAGUE

1. Education. Coöperation with the Board of Health.
2. Financial.
3. Tent colonies.
4. Day camps—children.
5. Special case committee for relief of nurses.

BOARD OF EDUCATION

1. Medical inspection.
2. Fresh-air schools. { Pretuberculous. / Tuberculous.

While the law enacted February, 1905, is not explicit, it is our interpretation that the registration of all cases of tuberculosis is required.

The information contained in these reports should be regarded as confidential, and action should be taken only when conditions require. The notification of a case of tuberculosis requires no action on the part of authorities if there is reason to assume that proper precautions are being observed for the protection of others. If, however, the tuberculous person is without a home or is living in a lodging-house, in a poorly furnished room, or with a family in a tenement-house, or is receiving charitable medical advice through a clinic, dispensary, or some other public institution, then all objection to the visitation and supervision by sanitary inspectors or nurses is removed, and in the interest of the public such supervision becomes necessary. In Cleveland the department takes the position that when a consumptive is under the care of a reliable private physician, and he will undertake to give proper instructions and see that safe conditions exist in the home, and such precautions adopted as are necessary to prevent the transmission of the disease to others, no further immediate cognizance of the case will be taken.

It is acknowledged that the spread of tuberculosis is due to the ignorance of the public. The longer this ignorance continues, the greater will be the loss of lives and money. We are endeavoring, so far as means will permit, to carry on a campaign of education. The ignorant consumptive is a source of infection at home and abroad—the educated consumptive a danger to no one. Education should be given a very high place in the list of our weapons. Our efforts are not especially directed to the adult, as it is believed that little can be done to impress the present generation, and this is by no means a denial of the curability of tuberculosis. Efforts should be directed almost wholly to the young. In conjunction with the Anti-Tuberculosis League and the Chamber of Commerce, lectures are given to pupils in public and parochial schools who have reached the age of understanding. A moving picture show is given from two to four times a week before lodges, church societies, unions, in public libraries—in fact, wherever an audience can be secured.

Nurses, in their rounds, leave printed instructions as well as verbal. It is important that care be exercised in the selection of trained nurses. They should be graduates of high-grade hospitals, and have had not less than six months' training by a visiting nurses' association.

When it comes to the knowledge of the department that premises have been vacated by the death or removal of a consumptive, inspectors are sent

to determine what measures are necessary to free the premises from possible infection: whether cleansing, disinfection, or renovation is required. When the physical condition of an apartment is fairly good and cleanliness observed during the illness, when sunlight and fresh air reached the infected rooms, cleansing and disinfection may be sufficient. Cleansing should be done by the owner by order of the health department, and disinfection by the health department "free of charge."

At our hospital for contagious diseases apparatus is now being installed which will enable the health department to sterilize by live steam carpets, rugs, pillows, mattresses, and textile fabrics which, for various reasons, cannot be sterilized at home. No plan has been worked out for the destruction of property, in view of the fact that in Ohio owners may be reimbursed from the health fund. In our present stage of development this is obviously too much of an expenditure for an already inadequate appropriation. In those instances in which the premises are dirty and the walls and ceilings filthy and in bad condition cleansing is not attempted, but a thorough renovation, which consists of the removal of wall-paper, repainting, calcimining, whitewashing, etc., is ordered.

The provision of suitable relief of various kinds is extremely important, and constitutes a very difficult part of the tuberculosis problem. In most cities this condition is again inadequately met for want of money, and little can be done in the way of supplying clothing, bedding, nursing, assistance in cleansing, housework, etc. We have been fairly successful in supplying food, as the Anti-Tuberculosis League, the Municipal Department of Charity, and many charitable organizations contribute. It must be borne in mind, however, that every city will sooner or later be compelled to enter socialism, at least to the extent of supplying the consumptive as his or her needs may demand. Several years ago Biggs, in his very complete discussion of this subject, recognized the difficult economic problems presented. Families consisting of a widow with small children—the income from all sources insufficient to maintain the family with food; the home well ventilated and commodious; the mother making every effort to obey instructions and heed suggestions, but insisting upon remaining with the children, as her presence is necessary to keep the family together. Undoubtedly, the mother would be better off in an institution and the children might be removed to an institution that would better protect them from the dangers of infection, but, as Biggs pointed out, we are confronted by the institutional child problem, and it must be noted that there is insufficient sanitary ground for the removal of a mother under these conditions. The

municipality should provide such food as may be required. If, however, the apartments are dirty and not well kept, poorly ventilated and dark, instructions not followed, and proper precautions not taken, then it is immeasurably better for the family to be separated. No uniform regulations can be laid down for the disposition of such cases, but each case must be considered as a problem in itself, and the ultimate decision in each instance determined after a careful consideration of the facts.

Hospitals for advanced cases need not be discussed, for to these institutions are admitted hopeless cases which have been transferred from the hospital for early cases and the clinics. This institution is, of course, the last resting-place of the advanced cases who are homeless, friendless, dependent, dissolute, and dissipated. With respect to the hospital for incipient cases, there is but one observation to be made—discipline must be maintained. No patient should be idle. If tuberculous patients are permitted to idle about, they will develop into intolerable nuisances. One grumbler will exert the most pernicious influence over his fellow-patients in a very short time. They should be compelled to work, not with a view of getting something out of them, but in order to keep them from brooding over their condition and also to keep their metabolism in a state of healthy activity. Probably the best occupation is that of gardening in season; attention to bedding, light wood working, or a limited number of hours to the liberal arts. All this keeps the patient's mind occupied without the suspicion that undue use is being made of them, and aids in dissipating the common fatalistic view. The control of admission to the hospital and sanatorium rests absolutely with the board of health.

Tenement-house regulation is a function of the department of health. Few cities have as yet dealt effectively with the situation. Cleveland is, fortunately, awakening. We are rapidly passing out of the stage when representative men of the community discuss this evil in subdued tones, on the ground that it is bad for business and will "hurt the city's fair name."

Far-seeing men realize that this policy but postpones the evil day, that continued tolerance of the conditions injures the city, and that a low death-rate and a well-earned reputation as a "city of homes" is the best asset a city can have.

Recognizing, as we do, that tuberculosis is a house disease, we have installed a Bureau of Tenement and Housing Inspection under the tutorship of Veiller, of New York.

In the light of scientific knowledge, milk must be regarded as being a factor responsible for the spread of tuberculosis, especially among the young.

If the public can be supplied with milk entirely free from the tubercle bacilli, an enormous stride will have been taken in the direction of ridding mankind of the disease.

It would seem the part of good judgment for health authorities to be conservative as to assuming a radical position as to the compulsory testing of dairy cattle. The dairymen must be trained to recognize the commercial value of a tuberculosis-free herd. The farmers in certain States have resisted radicalism through their general assemblies, believing that the proposed legislation would prove their financial ruin.

The real facts are that tuberculosis is a serious financial menace to the cattle and hog interests, and when the point is reached where packers will refuse to buy stock unless subject to postmortem examination, then the producer of stock will see the light from a viewpoint that legislation would not obtain.

Dairymen are not in business for the sake of their own or anyone else's health, and their education as to the broad bearing of tuberculosis has not proceeded far enough for them to appreciate their own interest.

As an immediate safeguard we are advocating the pasteurization of milk. This should be done under the supervision of the health department, as the so-called pasteurization is unreliable, as shown by recording thermometers and the laboratory investigation of Hess. We have had 14 "public slaughters" of reacting herds—the findings given publicity.

The Anti-tuberculosis League, in communities in which the health authorities are responsibly and systematically active, should confine its endeavors, in the order of their importance, to education of the people; coöperation with the boards of health; financing experimental problems; providing tent colonies, day camps for children, and special case committees for the relief of nurses.

The board of education provides a most powerful instrument when equipped with medical inspection and fresh-air schools. Any system of medical inspection that does not take into consideration the needs of all children of school age in the community, whether in public, parochial, or private schools, and the various eleemosynary institutions, is fundamentally lacking in that which pertains to the efficiency and happiness of the child, so soon to develop into the activities and responsibilities of civic life.

Education means efficiency, that is, the power to render to the State full value, otherwise the genius of our Republican institutions fails to realize its ideals.

Medical, sanitary, and hygienic inspection has for its sole purposes,

first, the maintenance of the normal child, who in school life may be surrounded by conditions that lead to his physical and mental impairment, and, secondly, the discovery of any defect or disability that may operate against the enjoyment of the largest measure of his school opportunities.

Not infrequently intelligent, well-to-do parents are wholly unaware of physical conditions that retard their child's progress in school. Again, many parents, by reason of ignorance or indifference, neglect the correction of conditions that have to do with normal development.

Inasmuch as the State is responsible for the compulsory attendance of children of school age during the developmental period of their lives, it necessarily follows that the State is responsible for all that pertains to the child's mental, moral, and physical welfare while in school.

The problems entering into the supervision of medical, sanitary, and hygienic inspection naturally divide themselves into two groups—first, that which relates to the child as a menace to the community, through the spread of contagious and infectious disease, because of the general contact with others in his school relationship, and, secondly, that which pertains to the child himself, affecting his individual development and progress.

The first necessarily requires police power, and should be delegated to health departments so empowered. The other, which is purely educational, should be under the direction of the board of education. Because of this natural division of responsibility, any mandatory law delegating to boards of health or boards of education sole authority in determining measures for largest good to the child in his dual relationship to the community must necessarily carry with it an appreciation of all concerned, that it stands for betterment.

The present law of Ohio, which is a simple modification of the statutes relating to powers of boards of education, is purely optional, granting to boards of education or boards of health, or jointly, the inauguration of such measures as would seem best suited to local conditions. The law grants, in the largest sense, without restriction, the fullest powers to do that which seems best in each municipality, and permits communities to determine what measures seem best adapted to their wants.

The work of medical inspection in the city of Cleveland is under the direction of the board of education. Its nurses and physicians are appointed and paid by the board of education. The relations with the health department are such that all authority for exclusion from school and reinstatement is delegated entirely to the health department, the board of education confining itself to the larger purpose of pointing out to the parents and mak-

ing them responsible, so far as it lies within their power, for the correction of physical conditions materially affecting their child's progress.

This plan seems to meet with a general acceptance by the parents and the teacher, and the child, when fully developed, will be productive of the largest good in the protection of the community from epidemics and giving to the child the fullest opportunity by correction of the defects that handicap him.

It is believed that all measures pertaining to the sanitation of buildings and their surroundings, such as proper heating, ventilating, lighting, water-supply, and baths, should necessarily come under the joint supervision of the health department and the board of education, clothed with power to effect such changes as may be compatible with accepted sanitary and hygienic demands.

It is the conclusion that the most satisfactory medical inspection to be obtained in large cities will be under the joint supervision of boards of education and departments of health. Boards of education should concern themselves with the educative features, the disabilities being pointed out by a large corps of carefully trained nurses, under the supervision of one competent physician, with comparatively few physicians assisting.

The work of medical inspection of school-children, of whatever degree of thoroughness, permitting treatment, exclusion, and reinstatement, with special care and observation of the ill-nourished and the tuberculous child, must necessarily find its largest usefulness if supervised by boards of health. It is questionable whether it is the moral right even of boards of education to do more than point out to the parents conditions, whereas boards of health might be permitted to insist upon correction.

Perhaps the most important phase of medical inspection pertains to the subnormal child, particularly those predisposed to tuberculosis, and the poorly nourished. The underfed child cannot in reason be expected to maintain a parity with those who are properly clothed and cared for. This is not a theory, but an actual condition, and when children come to school without breakfast, or subsist for days on black coffee and a crust of bread, they are in no condition to absorb the mental pabulum or conduct themselves with proper deportment. One of the most illuminating phases of this latter condition has been worked out in Germany and in many cities of this country with brilliant and most satisfactory results, where, through public or private aid, the child has been properly nourished.

The most gratifying exhibition of the general interest in the welfare of our school-children is illustrated in the realization of the importance of

creating open-air schools, where the child may enjoy the freest conditions, under the most favorable environment.

Tuberculous and anemic children enjoying the privileges of the fresh-air schools should be supervised not only by boards of education and boards of health, but under the direction of those specially qualified to diagnose and indicate their physical needs.

Another important institution whose endeavors bear upon our problem is the Babies' Dispensary and Hospital, which, for the present, is directing the department of Child Hygiene, and whose purpose is to give every needy infant in the city every chance to avoid infection with tuberculosis, and to acquire the highest resistance against it by carrying out its object, "to lessen infant mortality by helping needy parents keep their healthy infants well, and by assisting them in healing their ill babies"—in the following manner:

By beginning work as soon after birth as is possible; indirectly before birth, by referring all pregnant women to the obstetrician for antepartum advice.

By insisting upon intelligent breast feeding and weaning.

By helping parents obtain clean milk from tuberculin-tested cows, when, for some valid reason, artificial feeding has been advised.

By having a nurse teach the mother in her own home how to prepare the food for her child, as may be determined by the examination of the child in a dispensary.

By supplying the child with food prepared at the dispensary laboratory when the home conditions are bad.

By teaching the mother the value of light, ventilation, cleanliness, and proper clothing.

By keeping constant watch over the baby during the first year by the nurse in the home and the physician in the dispensary.

By caring for all sick infants.

By referring the entire family of the babies with tuberculosis to the tuberculosis dispensary; also referring any family member who is suspicious of tuberculosis or any disease to the proper place in the hope of checking further development.

The foregoing is, in brief, the result of one year's effort to concentrate the force in this field of activity.

So far as can be seen, there is nothing to prevent the realization of our

object, namely; lessening the prevalence of tuberculosis. This could not have been done excepting through the influence of a board of health and its employees—composed of men of the highest character, who were active in the various fields of charity, science, and business.

The president of the Cleveland Board of Health is the active head of the Anti-Tuberculosis League. The members are the chairman of the Milk Commission; a high-grade sanitary engineer; a first-class chemist; and an active young physician. The chief of the Bureau of Tuberculosis is the secretary of the Anti-Tuberculosis League.

Much of the strength of this board lies in the fact that, so far as the appointing power is concerned, their politics are unknown. It should be noted that this fact reflects credit upon the mayor of our city. This, with a friendly administration, places us now in a position to accumulate the statistical evidences of the merits of united efforts.

In conclusion, I desire to repeat Biggs' comment, with which he concludes his communication to this body two years ago: "The time is not far distant when those States and municipalities which have not adopted a plan for dealing with tuberculosis will be regarded as negligent in their sanitary administration and inexcusably blind to their best economic interest."

DISCUSSION ON PAPERS BY MR. FOLKS, DR. DEARHOLT, AND DR. FORD

Dr. Frank Billings, Chicago: Mr. President, and members of the Association: I feel almost like making an apology for speaking for Chicago at this time, because the work has only just begun. A few years ago Chicago, like other dense communities, considered the treatment almost alone of the incipient or so-called curable individual, while the advanced tuberculosis patient, who was considered incurable, was relegated to a custodial care and so far removed from those agencies which would give him comfort that it amounted to cruelty. In the crusade against tuberculosis, the recognition of its contagiousness, the general hospitals soon made rules which excluded the tuberculous individual from its walls, which resulted, in our own municipality, where the county cares for the greatest number of the sick, in the establishment, at the grounds upon which the poor-house or infirmary was located, of a hospital for the treatment of the tuberculous, and to that place were sent the incurable, and in many instances, of course, there went to the same place the incipient cases. At one time it was

stated there were 10 per cent. of tuberculosis easily recognized, but not advanced, among the poor-house patients. As it happened, I was on a committee to investigate the conditions at Dunning, and found the consumptive hospital without nursing of any pretensions—two day nurses and one night nurse for 225 patients; one resident doctor, and the food of the poor-house, which was ill adapted for patients so ill. I made an appeal to the medical profession, and through them to the commissioners of the county who had the matter in charge, and in consequence there has been built, since that time, a hospital of 300 beds in the city, on the same grounds as the county hospital, which corresponds to the usual municipal hospital of our cities. Since that time the incurable cases have been treated there. The trained nurses of the county hospital are assigned to duty there. The internes of the hospital are assigned to duty in the tuberculosis wards for certain periods, and the students are taken to those wards and taught to recognize tuberculosis in its advanced stages.

Three years ago the legislature of Illinois passed a law which enables municipalities and counties to care for their own tuberculous patients by voting of a tax. It is not mandatory. Those counties or municipalities which desire to adopt it may vote upon it at any election. Cook County, in which the city of Chicago is located adopted the law two years ago, and there has been made available for the treatment of the tuberculous sick of the city and county a sum of money that is sufficient not only to care for the patients of the city in an ambulatory way in the dispensaries, but also for the establishment of sanatoria. Preceding this act, a local tuberculosis organization, known as the Chicago Tuberculosis Institute, established in existing institutions seven dispensaries for the treatment of the tuberculous. The dispensaries are located in the dispensaries or outpatient departments of the several colleges, in two or three of the settlements, and one in the stockyards district. The Tuberculosis Institute had its corps of physicians, and as there was a lack of money, only one or two nurses at each dispensary to care for these patients. The municipality has taken over these dispensaries in the last year and carried on the work formerly done by the Tuberculosis Institute. In the colleges the general dispensary is used for the tuberculous patients. Dr. Ritter, who has a paper before the clinical section tomorrow, is the chief of that tuberculosis clinic in Rush Medical College. Students are assigned here, as to other departments in the dispensary, where they are taught to recognize tuberculosis, making physical examinations, and the idea is also to send them out to visit patients in their own homes, to observe the patients with the

nurses—there being from three to five visiting nurses at each dispensary—when they visit them in their homes. By this means we are bringing back into the educational institutions and to our hospitals the tuberculous patients who have for a few years been separated from us, robbing our students of the material from which they could learn to recognize tuberculosis, and depriving them also of the opportunity to see tuberculosis in the homes of the patients. Of course, it is not yet much, but the principle is established. It will be widened, it will be extended, as we go on. I think it is very important.

In the general hospital work I rarely see a tuberculosis patient. When I do see one who has been admitted or who has been admitted under some other diagnosis, under the rules of the hospital I am obliged to discharge him and send him to some other institution. Consequently, I cannot see that patient to improve my own knowledge, nor am I able to use that patient in the teaching of students. I have felt it very much. I was, therefore, glad when the opportunity came that we could utilize the patients in the way that I have named.

Dr. Livingston Farrand, New York: Mr. Chairman: I asked for the opportunity of speaking before I had read Mr. Folks' paper, and now, after I have read it, I find myself so thoroughly in accord with what he has said that I have very little to add. I have long been convinced that the sound method of handling this tuberculosis problem was to place the responsibility upon the public officials: that it was no matter for private philanthropy. If we are to place the responsibility upon the officials, upon what officials are we to place it? Now, the first steps that were taken were along State lines. We founded State sanatoria. I think the agreement is pretty general that while the State sanatoria have had a very marked and beneficial educational effect, they have had practically no effect whatever in meeting the real problem. They have not even scratched the problem, and they never will; but they have tended to stimulate work of very great value. Then came the question, if these State sanatoria are not meeting the situation, how are we to meet it? The intense and concentrated experience of the last few years would seem to indicate that probably the wisest method was to establish the campaign so far as possible upon a municipal basis, where the municipalities were large enough to handle the situation independently. It soon became apparent that there was still a large portion of the population, and probably the greater portion of the population, that was not gathered in centers of population large enough to deal independently with the problem, so that we had to choose another political unit.

The most obvious agency under such conditions was the county. Now, we have been engaged in the last three years particularly in urging the establishment of these various institutions, State, county, and municipal, and have not yet arrived at any agreement as to which is the best and which is the soundest basis of operation. We are feeling our way. I think if I can interpret the testimony of the country at large, it is that in the larger communities municipal responsibility is sound; that where there are not large enough communities, the basis to take is the county. Where counties are so sparsely settled that an individual county cannot assume the burden, we must have a union of several counties, or resort to the State to round up the problem.

We have come, during this last year or two, to a situation of difficulty in a considerable number of States—in Massachusetts, in Ohio, in Minnesota, in Michigan, in Wisconsin, in Missouri, in New Jersey—where we are discovering that a few counties will establish the desired institutions, but the rest of them hang back. As a consequence, has appeared the proposition of State subvention, which I was very glad to see Mr. Folks brought out in his paper. There is some doubt as to the economic advisability of State subventions in general, but we are probably going to be forced, in a very large number of cases, in order not to meet with undue delay, to press for some sort of State aid. After thinking this over very carefully in the light of available experience, it has been suggested that we might, in favorable instances, try out a combination of county, State, and local resources. That is to say, a county institution in which, if the cost of maintenance be $10.00 a week per patient, the State shall make a subvention of $5.90 per week per patient, or whatever amount may be determined upon, while a certain small percentage of the cost of maintenance shall be charged to the locality from which the patient comes; let that local charge be, say, $2.00 a week. The county would then construct and operate the institution and pay the remaining $3.00 per week or such balance as may remain.

I frankly admit that I do not know whether such a plan will work out advantageously, but something of the kind will undoubtedly be tried out. In other words, we are not in a position to say definitely just what is the final and the absolutely sound unit of operation, but we are pretty well convinced, from the experience of different localities in the United States, that, so far as possible, we ought to throw the responsibility back on the local unit; where that is not possible, upon the county, last upon the State, and never upon the nation.

Edward F. McSweeney, Boston: I have received great inspiration from the reading of Mr. Folks' paper by Dr. Farrand. I am not a doctor, but a layman accidentally put into this work, who has remained in it because he believes it is his duty not to get out until he finishes the job in hand. In Boston we have already spent a million dollars in anti-tuberculosis effort, and have outlined what we believe to be the present proper limits of municipal effort in this direction. The hospital beds for dying consumptives already provided at the expense of the municipality, and those which we hire in private hospitals, which we hope later to replace by municipal beds, are almost sufficient to meet the present needs of Boston. In a paper which I shall read before the Sociological Section tomorrow I will try to show in detail some of the enormous costs of this disease.

When we started our work in Boston we were fortunate in getting the advice of the best authorities in the country as to what we should do, and were told to do a specific thing, *i. e.*, to provide hospital beds for the advanced cases. We also had the good fortune at that time to have Mr. Alexander Wilson connected with the work in Boston, and I wish here to record my appreciation of his services in this cause.

Accepting the advice given us at the beginning, we started in to provide beds for the advanced case. The only troubles and heart-burnings that have come to us since then have been the attempts of the same persons who told us to concentrate our effort in this single direction to pull us away from the care of the advanced case by diverting expenditure into ephemeral efforts, which, if attempted at all, should be only at private expense—things that appeal to impulse and emotion rather than to common sense; efforts to cure the individual after he has been allowed to become diseased, rather than to prevent him getting in this condition.

I have heard with delight the truths enunciated in Mr. Folks' paper—so sensible and sound; but there is no power in our organization to go back and say with authority to any community contemplating taking up tuberculosis work that the all-essential need is to stick to the fundamentals, *i. e.*, to care for the advanced case. What happens is, the moment the community takes up this kind of work, it is immediately diverted into non-essentials, pulled hither and yon by well-meaning people, with the result that a large part of the money already appropriated in this country to conquer tuberculosis has not resulted in any appreciable diminution of the disease. I believe that the solution of this question is in treating the advanced case, and this is wholly within the financial power of every community in the nation today. If this work is begun locally and carried out

to the extent of providing hospitals for advanced cases, we have the problem within our grasp.

Without disparagement to any other municipality, Boston is, in this work, distinctly in the lead. Cleveland has taken up health work by its Chamber of Commerce, and is gradually bringing order out of chaos, but in tuberculosis work Cleveland has done nothing as compared to Boston.

In New York there is too much division of health responsibility, which is also true in Boston, but our trustees have already recommended that our own board should be abolished, and our work turned over to a central health administration, which shows that we are ready to practise what we preach.

In Baltimore I understand that control of all health matters has been put under the control of the board of health, which in my opinion is right. This principle should be further extended, that boards of education should be given the full responsibility of a medical examination of school-children, so that everything pertaining to the child's life, from five to fifteen years of age, as far as the municipality has the right to order it, physically and mentally, from the time it enters school until it is ready to be graduated from the grammar school, should be considered as a part of its formal education, and these duties should not be divided between two boards. A child getting scarlet fever, diphtheria, or tuberculosis, whose presence in school is a menace to his fellows, is no longer a problem for the educational but for the health authorities.

Regarding the question of subvention or subsidy, I want to say that, superficially, the scheme is an attractive one, and two or three years ago I personally believed in it. I attended the tuberculosis convention in Sweden in 1909, however, and had the great privilege of being a fellow-passenger to Europe with Dr. Welch, the president of this Society, and I do not know any better education on hygiene, sanitation, or medical matters than to have the opportunity to talk with him. Subvention as it works in Sweden is a success, because the money is not taken out of taxation, but came as the result of a great popular subscription to the late King Oscar on the occasion of the twenty-fifth anniversary of his reaching the throne. The people gave him a number of million Kronen, which he immediately turned back to be utilized in tuberculosis work, and this free gift, coming from the people to the king, is now being used to stimulate local communities to activity in the work which they should and ought properly to perform. If a Carnegie or a Rockefeller in this country would put ten million dollars into a fund which could be given to local communities which will erect

hospitals for advanced cases, this would do a great good, and is the proper idea of subvention, which would help greatly in the prevention of the disease, but a subvention, taken out of a State treasury, derived from taxes, means only that the tax-payer takes the money out of one pocket to put it into the other, and the inevitable result would be that the cities and towns, which would do the work anyway, will have to pay for those who are now laggards and will be laggards under any condition of subvention law that could be conceived.

Dr. Alfred Meyer, New York: Mr. Chairman, I feel almost like apologizing for having been born in New York, but I made it a point to come away from there to Denver. I feel sorry to have heard New York put perhaps in the third class—I do not know where to put it; I know where to put it geographically, but sociologically, after what I have heard, I think I will go home a very much humbler man than when I came here.

None the less, Mr. Chairman, with all due respect to what has been done in Boston and Cleveland, I think New York still may be proud of some of the work which it has done in tuberculosis. I admit that the State of Massachusetts has led the Union, as it has in many other fields of work, in the establishment of State sanatoria. Credit should go to Massachusetts for that work. In this connection I feel sorry that I was not born in Massachusetts, because of the beautiful ideals it has set us along that line. But no matter if New York could not lead in that work, it, at least, was a good follower, and if you look through the history of the development of State sanatoria you will see that New York was second. I do not know where Cleveland belongs, but I think a little further along the line.

I admit there are defects in the tuberculosis work in New York city. Having been one of the men connected with the drawing up of the original bill that led to the establishment of the State sanatorium, and having been connected with some of the State agitation for the development of that line of work, I should like to remind Dr. Farrand, who was not associated with the work at that time, that the men who led in that movement distinctly had the conception that the State should not do *all* the work, but, as the larger political unit, it should set an example to the smaller political units,—call them counties, call them townships, call them municipalities, whatever you wish,—but the State as the parent body, in a certain sense, should set the example to the younger and smaller units as to what should be done.

Now, as a matter of fact, that method has been developed in the State of New York since that day. New York, after some considerable work,

received an appropriation, during the administration of Governor Roosevelt, of $50,000, which set the ball rolling, and after some delay we established our institution at Ray Brook. Soon after that the agitation for the development of municipal sanatoria started in New York city. I read a paper—I must be a little immodest, because, as a matter of history, I took part in the development of this work, and I believe, for a small man, a rather active part. The first plea made in the city of New York for the establishment of a municipal sanatorium for the consumptive poor of the city was made by me in the Academy of Medicine about eleven or twelve years ago, and I personally got together all the bodies, medical, municipal, and charitable, which ultimately led to the establishment of the first county institution in the State of New York, now at Otisville, an institution which I believe sets a good example as a type of municipal tuberculosis work that might even be followed, and advantageously followed, by our New England States—I take my hat off to them—or the western State of Ohio.

Now, with reference to the State doing all the work, not only do I not want to see that done, but I can see a potent argument today against the State taking all the problem on its hands, or agreeing, as has been advocated here tonight, to a division of the financial responsibility. I see in that a fundamental objection, namely, that it will lead to a divided responsibility. I say let those few isolated cases of tuberculosis in counties where there are 542 inhabitants and one-half a person has tuberculosis—let that go unsolved for a while. Theoretically, it may be worth while to take care of that half a case, but practically, I say let it go. And if you cannot, or if you do not want to do that, take a half-dozen counties with twelve or fifteen or twenty cases in them, and bunch them together and let them join forces, for, I believe with the last speaker, that we are apt to make permanent laggards of them if we are always holding them on their feet.

With reference to one point more, Mr. Chairman,—I am afraid I am taking too much time,—but also in defense of the truth, in regard to the management of this question in the municipality of New York, I want to say this winter there has been started a coöperation which is promising a great deal on the part of three of the great municipal departments of the city. Heretofore the tuberculosis problem has been dealt with primarily by the Charities Department, secondarily by the Health Department, and thirdly by the Bellevue and Allied Hospitals. These three departments have squarely come together, as I think the municipal departments ought always to do, in a spirit of coöperation for the good of all the citizens, whom they are supposed to serve, and they have created what they call a Hospital Admissions Bureau. I do not believe that any of the other States of which

we have heard tonight has established any such coöperation between municipal departments, practically making a clearing-house for the disposition of the tuberculous poor of the city, thus preparing the way primarily for their being sent, we will say, to the municipal sanatorium at Otisville, or fitting them up and making all preparations for sending them to the State institution at Ray Brook, or perhaps distributing them to the various private institutions, but wherever they have been sent this clearing-house, made up of these three great departments, has aided the cause of the consumptive poor, which depends upon the mercy and honor of the more fortunate citizens, and upon the mercy and honor of the departments that are sometimes too much criticized. Now I know that we have defects, but I wanted to bring out some of the virtues of the city from which I have the honor to come.

Dr. H. M. Bracken, Minneapolis: Unfortunately, I did not hear the first papers. I certainly agree with Dr. Farrand that the State should help, but I do not feel that the State should take the entire responsibility in the care of the tuberculous. If we keep the various localities interested in their own problems, we will reach the cases of which Dr. Welch spoke this morning—the advanced cases, the ones that do not make the grandstand play, but the ones that are to be considered in prevention. We may consider the early cases from the point of the individual, but the advanced cases must be considered from the standpoint of the community. I think Ontario was the first district to take up the question of county institutions, and to provide not only aid in the construction of these institutions, but also aid in their maintenance. I have always looked at this Ontario plan as rather the ideal.

Reference was made to public health workers. Now, certainly tuberculosis is a preventable disease, and certainly public health officials should not be released from their responsibility in dealing with it; and that being the case, why should they not be the leaders in this work? If they are leaders, why can they not be put on a plane similar to that of the departments of education in some States, at least, where the schools receive State aid on the condition that they are up to a certain defined standard. If we are not careful, we will, in the course of a few years, have a great variety of institutions for the care of the consumptive. Some of these we will be thoroughly ashamed of. We should be ashamed of some of those now in existence.

If we have a standard for institutions, and if we can say to those in charge you can have State aid if your institution is up to that standard, we are holding out inducements for the rapid establishment of local institutions.

It is possible that the larger municipalities, such as New York, Chicago, Boston, etc., may be able to take care of their cases, but we must look to the county as the unit for the more thinly settled districts.

Let it be understood that there is a standard for an institution; let such institutions be for a county or a group of counties, or even a private institution like that at White Haven, Pa., or the Gaylord Farm in Connecticut. If it comes up to a standard, why should it not receive State aid? I hope to see the time when we will not try to throw the whole burden on the State or on the locality.

Dr. Dunning S. Wilson, Louisville: I feel that the points of the compass will not be well rounded out unless some one from the South has an opportunity to speak.

I have been very much interested in this particular subject tonight because we are approaching the time when legislation should be enacted, and we like to be as modern and up-to-date as possible. Kentucky has been somewhat slow about a good many things, and possibly for its own good, in the fact that we shall not be wasting much money in establishing large State sanatoria which have proved inadequate to handle the proposition. I have felt for a number of years that the expenditure of money for the establishment of State sanatoria was unwise. I have maintained also that such a sanatorium soon became a part of the political machinery or a political asset, and in that respect especially lost some of its usefulness. I have thought all along that the State should subsidize sanatoria, and, as Dr. Bracken said, even though they may be private sanatoria, they should be subsidized provided they come up to a certain standard.

About four years ago the State of Kentucky passed an act which provided that any sanatorium established in the State which was not maintained for profit should receive from the appropriation a certain per cent. for its maintenance, and out of that fund one sanatorium in the State, which is located in Jefferson County, in which Louisville is situated, made use of it, and it has stood as a model for the State. I think that the city, the county, and the State should work hand in hand, the State inspector going through and inspecting the sanatoria. In Louisville we have a combination of city and county control which is working out very nicely. An act of the legislature provides that a tuberculosis hospital board, as it is known, shall use a certain percentage of the city and county taxes for carrying on this work in dealing with tuberculosis, and that board has practical control of all the tuberculosis work in the city and county. It has charge of its nurses, charge of its dispensary, and charge of its sanatorium, and also is establishing a hospital for advanced cases.

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Philadelphia

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EUGENE T. LIES

Minneapolis

OPEN-AIR SCHOOLS

By Leonard P. Ayres, Ph.D.
New York

The report of the recent United States Census will tell us that the greatest industry in Denver is that of trade and transportation, in which about 30,000 people are engaged, and that the greatest sedentary class in the city is that engaged in professional occupations, which includes about 8000.

Although these will be the official figures, they will be wrong, for the greatest industry in Denver is not trade and transportation, but public education; and the greatest sedentary class is not made up of the 8000 people engaged in the so-called professional occupations, but of the 40,000 teachers and children engaged in teaching and being taught in the public schools.

A similar condition exists in every city throughout the land. Everywhere the largest, as well as the oldest, organized industry is education, and everywhere the greatest sedentary class is made up of our school-children. It is only within the last few years that schoolmen have begun to ask what effect these long years of sedentary indoor life have on the physical welfare of our school-children, but now that they are awake to the significance of the problem, they are facing it squarely and acting energetically.

Ten years ago our greatest educational association met in Detroit and discussed the problems then foremost in educational thought and action. Diligent search through the printed report of that meeting discloses no single address devoted to the physical welfare of childhood. Next month that same association will hold its annual meeting in San Francisco, and on this year's program no fewer than 26 papers are devoted to the subject of health.

This profound change reflects no temporary fad or passing whim. It means that a fundamental change has taken place in educational ideals. It means that schoolmen have come to a startled realization that compulsory education, under modern city conditions, too often spells compulsory disease.

Excepting only our jails and our insane asylums, our schools are the only

institutions where attendance is compulsory, and, fortunately enough, few of us have to attend our jails and insane asylums often or frequently. It is a tardy realization of the significance of this feature of compulsion that has brought us to see that when the State compels every child to attend school, it incurs the obligation of furnishing an education fitted to the needs of every child.

This has brought schoolmen face to face with the problem of what to do for the child who is in poor physical condition, and is at the same time compelled to attend school. The solution was found about seven years ago in Germany, in the open-air school, in which the ailing child could continue his education, and at the same time regain his health.

This educational innovation combined the best features of the sanatorium, the playground, and the school. The classes were held in the open air, the children were well fed and warmly clad, and the school work was cut in half.

The results were marked and immediate. The children, who had been chosen for the new school because they were pale, pinched, thin, and anemic, became in a few short weeks strong, rosy, and healthy. They put on weight and gained in mental alertness. Although they spent less than half as much time at their lessons as the normal children in the regular classes, they made even better progress. The working plan of the new type of school has been summarized as consisting of double rations of air, double rations of food, and half-rations of work, and it may be added that the result was double portions of progress, both physical and mental.

So complete and convincing was the success of the first school that its fame spread abroad, and in quick succession other similar schools were opened throughout Germany, in England, and in France.

The credit and honor of starting the first open-air school in America must be shared by New York and Providence. In 1904 the former city loaned the services of one of its public school-teachers and supplied school material for teaching the children of an out-of-door hospital for tuberculous children. The first American open-air school, as that term is now understood, was opened in the city of Providence, R. I. In the year 1907 there was in that city a group of children whom the medical inspectors had noted as being particularly thin, sickly, and emaciated. The solution of the problem that these children presented offered a splendid opportunity for coöperation between the educator and the school physician. If these children were kept in the regular class-rooms, it was evident that they would continue to go down hill physically. If they were excused from attendance

at school, there was no place for them to go, and plainly they would suffer educationally and probably would be no better off physically.

The solution came in January, 1908, when the school authorities of Providence remodeled a school-room of an abandoned building so as to convert the ordinary four-sided room into one of three sides, leaving one entire side open to the air. In this room they began, in the dead of winter, to teach the class of children variously termed anemic and pretuberculous. The children wore their outdoor wraps, sat in warm sitting-out bags, and on cold days had warm soapstones at their feet. They were well fed, and their school studies reduced in quantity, but not in quality.

Immediately they began to improve both physically and mentally, and just as in the case of the German school, they made marked improvement in their school work.

Six months after Providence began work an open-air school for tuberculous children was started in one of the Boston parks. There were 41 children in that school, and after the first summer's work it was found that there were 23 cases where the disease was either arrested or entirely cured. These 23 children were sent back to the regular schools, and at last reports all but two of them were still enjoying good health.

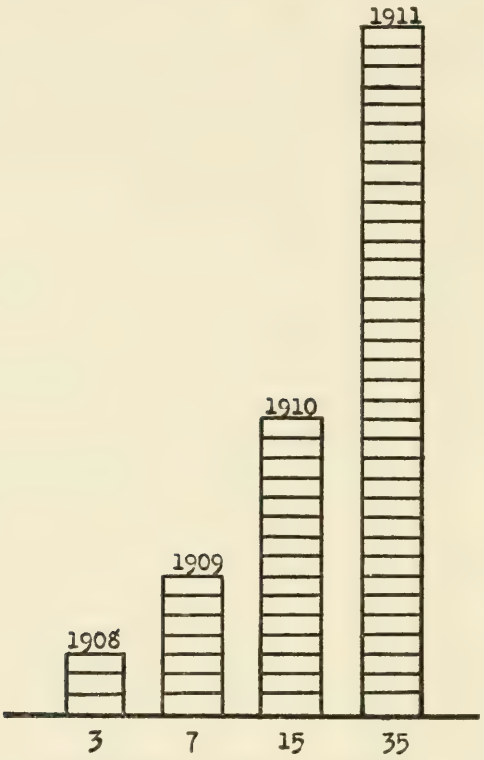
Five months later, in December of 1908, a new school was opened in New York. This latter instance is particularly interesting for two reasons: First, because the school was opened on an abandoned ferry-boat, which shows what good use may be made of apparently useless localities, even in the most congested cities. The second interesting feature is that this school was opened on the petition of the children themselves. They were the patients who were convalescing in one of the hospitals, and who were being given open-air treatment on the old ferry-boat. One day these children got together and organized a strike. They told the doctor in charge that they wanted to have a school. The Board of Education at once offered to furnish them a teacher and school material, and so the school was opened. Since that time three ferry-boats and a roof have been pressed into service.

In Chicago work was begun in a camp during the summer of 1909, and since that time very notable progress has been made, both in open-air schools and in cold-air rooms in that city. These were the only schools in Chicago which had no Christmas vacation last winter. The children simply refused to take a vacation. They demanded that they be allowed to go to school, and the school authorities yielded to their demands.

The same story, with minor variations, was repeated in city after city across the country, and in every case the open-air school demonstrated its

ability to take pale, wasted, and sickly children and convert them into strong, vigorous, and healthy children.

Because of these results the open-air school has made an appeal to the popular imagination quite unequaled by that of any other educational innovation. No single case of failure has yet been recorded, and no city that has undertaken the work has subsequently abandoned it. Providence and two other cities began the work a little more than three years ago.



CITIES HAVING OPEN-AIR SCHOOLS

During the following year 7 cities had open-air schools. Last year the number was 15, and this year it is 35. Each year the increase has been over 100 per cent.

There is but scant time in which to treat the important problems of administration and cost. In most cases the open-air schools are administered by a partnership of responsibility. In the majority of the cities the

cost for teachers' salaries, added equipment, etc., is met by the Board of Education, while the expense for food and clothing is defrayed by hospitals, charitable organizations, and societies for the prevention and cure of tuberculosis. Data as to the administration of 47 open-air schools in different American cities are as follows:

Board of Education and Tuberculosis Association	20
Board of Education and private association	11
Board of Education only	7
Board of Education and other city department	6
Tuberculosis Association only	2
Board of Education and private fund	1
	47

The premises occupied by the new schools are as varied as the form of administration. Among 39 schools the following variations are found:

Remodeled rooms	14
Special buildings	6
Roofs	6
Open windows	5
Boats	5
Tents	2
Barn	1
	39

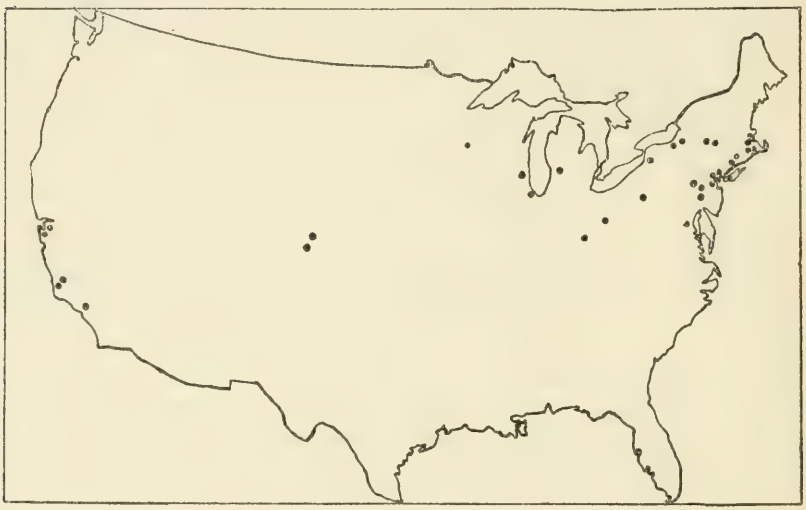
The children received by the schools vary from those openly tuberculous, to classes of entirely normal children in expensive and exclusive private schools.

The matter of cost is difficult to determine, for it depends almost entirely on local conditions. The only certainty is that the cost will always be greater than that of the ordinary class. To begin with, there are only about half as many children per teacher, the desirable limit being about 20. In the second place, the expense for food must be met from some source. This expense amounts to about 16 cents per child per day, and some cases run as high as 25 cents. In the third place, there is the individual equipment of each child, which is necessarily expensive. Its items, with their cost, are about as follows:

Blanket	$5.00
Eskimo suit	3.50
Sitting-out bag	3.00
Cot	1.75
Felt boots	.60
Mittens	.40
Thermometer	.25
Tooth-brush	.20
	$14.70

This individual equipment is in the nature of permanent investment, and can be used with slight repairs and replacement for several years. Taking all these different added expenses into account, it is fair to say that the education of a child in an open-air school costs nearly three times as much as does the education of the same child in the ordinary school. The other side of this proposition is that it is worth three times as much.

To summarize: The open-air school is a combination of sanatorium, playground, and school-room, in which the daily régime consists of double rations of air, double rations of food, and half-rations of work. There are eight requisites, of which the first three are imperatively essential. These three cardinal requisites are: First, abundance of pure air; second, plenty



Cities Having Open-air Schools

of good food; and third, sufficient warm clothing. The other requisites are only less important. We have enumerated three. Number four is shelter from the wind, for experience teaches nothing more clearly than that it is wind, and not low temperature, that causes suffering from cold. Number five is shelter or refuge, where the children can be taken during very inclement weather, and where any child who gets chilly during the session may at once go to get warm. The sixth requisite is provision for sleeping after the noon meal. For this purpose short folding cots are much more satisfactory than the steamer-chairs ordinarily used.

Number seven consists of the services of a skilful doctor and a competent nurse. These do not, of course, have to be in attendance continuously, but should be available. Last, but not least, it is necessary to have in charge a teacher who is intelligent, able, and imbued with the habit of success.

These requisites are many, and they are essentially expensive in time, intelligence, energy, and money cost, and yet the real question is not whether a city like Denver can afford to establish open-air schools, but rather whether it can afford not to establish them.

Figures for Germany, England, Sweden, and seven American cities indicate that, in the average city, the children in need of such treatment as that afforded by the open-air schools constitute about 3 per cent. of the entire school membership. This means that Denver should have open-air schools for about 900 children. When such figures as these are mentioned, the objection of expense at once looms high, but it must not be forgotten, when we are considering expense, that about 90 children of school age die each year of tuberculosis in Denver. On the average, they have had about seven years of schooling, for which the city has paid about $300. This means a loss of $25,000 a year in this city in money expended in educating children who die of tuberculosis before they grow up. Twenty-five thousand dollars a year spent on open-air schools designed to prevent this frightful waste would go far toward meeting the entire expense.

But the matter of expense and preventable money loss is not the most important phase of the problem of the open-air school. Compute as we will, we can never arrive at an estimate in dollars and cents of the value of wrecked hopes and ruined homes.

I do not believe that the open-air school is to win its most notable victories merely as a factor in the fight against tuberculosis. Wonderful as its brief history has been, it is still one of promise, rather than of fulfilment.

The open-air school will take its place in the history of education as marking one long step toward that school system of the future in which health will be contagious, instead of disease, and where pure air, pure water, and abundant sunshine will be rights, and not privileges. In that school of the future the child will not have to be either truant or tuberculous, or delinquent or defective, to get the best and fullest measure of education.

FOUR MONTHS IN THE OPEN AIR—A STUDY OF 60 CHILDREN

By O. W. McMichael, M.D.

Chicago

To the Charlottenburg forest school, near Berlin, may be given the credit of inaugurating a world-wide movement for the emancipation, not only of the tuberculous child, but of all children, from the injurious effects of bad air.

In Chicago the Chicago Tuberculosis Institute, with the coöperation of the Board of Education, established the first outdoor school on the grounds of the Harvard school in August, 1909.

The equipment and teachers were supplied by the Board of Education, while the selection of the children, the medical service, nurses, attendants, food, and transportation were provided by the Tuberculosis Institute, and 30 children were cared for for thirty days, with an average gain of four pounds per pupil. The success of this school led to provision for continuing the work during the winter, and developed two phases: The open-air school for tuberculous children, and the open-window room for physically subnormal children.

The open-air school, which opened in October, 1909, was made possible by a grant from the Elizabeth McCormick Memorial Fund.

This school was on the roof of the Mary Crane Nursery, and continued throughout the winter, with an attendance of 35 tuberculous children, recruited within a radius of four miles.

In September, 1909, two rooms were opened in the Graham school, "to show what natural cold air will do for normal children," and toward the close of the school year the number of rooms was increased to seven. No selection of individuals was made, except that the children were given their choice of entering a cold room or a warm one. No records can be obtained as to the physical condition of the pupils, either before or after the experiment, and the only information obtainable regarding the physical condition of the children is that, after eight weeks in the two rooms first opened, the

school physician found nasal discharges entirely absent, while in two similar rooms with heat he found that 40 per cent. of the children had nasal discharge.

There seems to have been no definite regulation as to how much or how little the windows were to be open, and the only available information as to the temperature is the statement, "It was rare that we could get the temperature low enough to make it worth while to look at the thermometer for a record."

Without records the experiment was described as "satisfactory," and it was planned to continue with 20 open-window rooms, but after the resignation of the principal, the experiment was modified.

In the summer of 1910 three open-air schools were conducted in different parts of the city, by the combined efforts of the Chicago Tuberculosis Institute, the Chicago School Extension Committee and the Board of Education.

These schools cared for 75 tuberculous children and continued five weeks, with an average gain of four pounds per pupil.

During the present year the open-air activities have been as follows:

ELIZABETH MCCORMICK OPEN-AIR SCHOOL NO. 1.—Roof of Mary Crane Nursery. Opened October, 1909, with 25 tuberculous children. Supported by the Board of Education and the Elizabeth McCormick Memorial Fund.

ELIZABETH MCCORMICK OPEN-AIR SCHOOL NO. 2.—Roof of Cregier Municipal Bath. Opened in February, 1911, with 24 tuberculous children. Supported by the Board of Education and the Elizabeth McCormick Memorial Fund.

Routine.—The children in these two schools are dressed in Eskimo suits provided by the school. They are given three feedings a day—two lunches and a meat dinner. They rest for one hour and a quarter, and longer, if necessary, on canvas cots. Pulse and temperature are recorded twice daily, weight once a week. Children selected on careful medical examination and have daily medical supervision.

FRANKLIN OPEN-WINDOW ROOMS.—Two rooms in the Franklin public school where the windows are kept open and the heat turned on. First room opened in February, 1911; second in March, 1911. Twenty anemic and physically subnormal pupils in each room. Supported by the Board of Education and the Elizabeth McCormick Memorial Fund.

Routine.—The children in these rooms retain their ordinary outdoor wraps. Extra sweaters and coats have been furnished in certain cases.

They are given two hot lunches a day, and rest at least one hour a day on canvas cots. Temperature recorded twice a day, weight once a week.

GRAHAM OPEN-WINDOW ROOMS.—Ten rooms in the Graham public school where the windows are kept up or down, to suit the teacher, and the heat is turned off. Pupils are normal children, about 45 to a room.

Routine.—Exactly the same as in the ordinary school-room, except that there is a great deal of physical exercise. The children wear only their ordinary outdoor wraps, and no extra meals are given. There is no special medical inspection or supervision.

HAMLINE OPEN-WINDOW ROOM.—Room in the Hamline public school where the windows are kept open, and the heat is kept down to about 60° F. Opened in May, 1910. Twenty anemic pupils, no medical supervision. Supported by the Board of Education and the Chicago School Extension Committee.

Routine.—Children wear outdoor wraps. They are given two lunches of hot milk and crackers, and have an hour's rest in steamer-chairs. Other routine is the same as that of the ordinary school.

MOSELY OPEN-WINDOW ROOM.—Room in Mosely public school where windows are kept open and the heat is kept down to about 60° F. Opened in January, 1911. Twenty-five anemic pupils. Supported by the Board of Education and the Chicago School Extension Committee.

Routine.—Same as the Hamline school. The Mosely school also serves a penny lunch at noon, and many of the open-window room pupils eat there.

The 60 children referred to in the title of this paper were 24 tuberculous children in the Elizabeth McCormick Open-air School No. 2, and 36 physically subnormal children in the open-window rooms in the Franklin school. The 24 tuberculous children had been under observation at the Polyclinic Dispensary of the Municipal Tuberculosis Sanitarium. In the immediate families represented, 56 individuals either have tuberculosis or have died from the disease.

No children were admitted who had open lesions or who had tubercle bacilli in the sputum.

A rigid physical examination was made at frequent intervals, and all findings recorded.

For the purpose of determining the value of the open air, rest, and food, all medication was avoided, except in cases of urgent need.

Of the 24 children, 15 had been on tuberculin treatment for varying periods and had gained 105 pounds, or an average of one pound a month.

In the open-air school, with the advantage of the open air, food, and

rest, that they had not had at home, they made a combined gain of only five pounds in three months. All were showing a slight loss in weight, so tuberculin treatment was resumed. The loss in weight continued the first week, but at the end of the remaining three weeks the 15 had made a gain of six and a half pounds, or more than they had gained in the previous three months.

This gain is particularly significant when we consider that it occurred at a period when, owing to weather conditions, there was a loss of weight in the other pupils in this and in the Franklin school.

The Elizabeth McCormick Fresh-air School No. 2 is located in one of Chicago's most densely populated districts.

The building is a two-story structure with a flat roof. On the first floor is a public bath, maintained by the Department of Health. On the second floor is a five-room apartment, used as a kitchen, dining-room, and examination room for the school, and here also accommodation is provided for the free dental clinic, established through the coöperation of the Chicago Dental Society.

On the roof was constructed a school-room with a canvas roof, and a continuous row of windows on all sides, extending from a base four feet high to the roof. The windows are closed on the windward side, so that at all times we have three sides, or in bad winds at least two sides, open, and the daily temperature record corresponds within one or two degrees with that of the weather bureau.

Outside the school-room, over the remainder of the roof, is a canvas shelter roof, protected on two sides, and here the children have their rest hour in sleeping-bags on canvas cots.

The children come early, and are first given a cold shower-bath and then a brisk rub by an attendant. No child has asked to have the cold shower omitted, or even to have the bath tempered.

A lunch of milk and bread with jelly follows, pulse and temperature are recorded, medical examinations made of those demanding special attention, and the amount of work and rest prescribed for these. Eskimo suits are donned, ready for school at 9 o'clock; school continues until 10.40, when the younger children have their rest period for an hour; then tooth-brush drill and dinner. After dinner the older children have their rest hour, and at 2.15 the younger ones rest again; at 3.15 a lunch of bread and milk is taken. There was a standing rule that no sleeping child should be awakened. An attendant reported the actual time asleep. A child lying quietly, with eyes closed, was assumed to be asleep. The maximum daily average for the

period was eighty-one minutes; minimum daily average, two minutes. The change in food caused some irregularity in bowel movements, and made it necessary to obtain accurate information regarding stools and frequency of urination, both at school and at home. To overcome constipation, children were required to drink water at specified times during the day. The individual records show an average daily consumption during March and April of 12 ounces of water, while in May the amount increased to 19 ounces. Under the influence of water drinking and adjustment of diet, constipation was overcome, with an average of 1.7 stools a day and a frequency of urination of 2.8. The children were allowed all the milk they would drink, and for February and March the daily average was 37.3 ounces, while that for April and May was 42.4 ounces. These figures were compiled from individual records, and the totals checked against the quantities purchased. The food served was of good quality, well cooked, and the daily ménu was submitted to the physician in charge for approval.

In arriving at the caloric value, each item of food purchased and served was estimated at its caloric content. Deductions were made for attendants and visitors, but none for waste, which was so small as to come within the allowance provided for in the tables consulted. The food values estimated upon this basis amounted for each child per day:

For February	2239	calories.
" March	2984	"
" April	2544	"
" May	1288	"

The children were required to bring each day a written report of what they ate at home the evening before and in the morning before coming to school.

The Monday record included the meals at home on Saturday and Sunday. These reports were frequently verified by the nurse on her visit to the home. Reports manifestly incorrect were discarded and sources of error avoided as far as possible.

The records for four months show a daily average of 450 calories and on Saturdays and Sundays 1002 calories.

This last item shows an interesting side-light on one of the causes of the condition of these children, namely, underfeeding.

The heat-producing units consumed by these children are the equivalent of the needs of a man doing physical labor, and it is interesting to note the decline in heat-producing units with the moderation in outdoor temperature.

The children in this school all made steady gains in weight, with the

exception of several who lost during the very hot weather of the last fifteen days, but they did not make the gain usual for normal children of like ages. There are several factors that tended to produce this result. During the period 12 of them were operated upon at the school for enlarged tonsils and adenoids, and the operation in each case was followed by the loss of five or six pounds. They had an average of five decayed teeth, and during the last six weeks all of them were in the dental chair for extractions and fillings. There were no school-grounds to allow freedom for play and exercise. There was too great anxiety on the part of the children to make a record in scholarship. While, so far as appearance and body weight are concerned, these children are more nearly normal than the group of children in the fresh-air rooms, they lack endurance, and are particularly sensitive to disturbing influences. The temperature-curve is in every case above the normal line, with a range from 97° to 100° F. They come from poorer families than the children of the fresh-air rooms. Of the 24 children in this school, the families of all but two are receiving aid from the United Charities, nearly all live in basements or in the rear of crowded tenements, and, even with the aid of the United Charities in providing better quarters, only 10 of the children sleep alone.

Early this year there was organized an advisory board, with representatives from the Board of Education, the Chicago Tuberculosis Institute, the Municipal Tuberculosis Sanitarium, the Chicago Medical Society, the Chicago Dental Society, the Chicago School Extension Committee, and others, to formulate a régime for open-window rooms in the public schools. Reliable information on the subject was so meager that it was thought best to open one or two rooms under definite conditions and observe the results. The Board of Education offered a room in the Franklin school, with freedom to conduct the experiment in whatever manner might be deemed best. A physician was intrusted with the arrangement of details and the daily observation of the work. The room selected was an ordinary school-room, capable of accommodating 50 pupils; it had a southern exposure, and the long wall had four large windows, which occupied the entire wall space, less about ten feet between the windows and at the ends of the room. Heat and ventilation were supplied through a duct in one corner of the room, about eight feet from the floor, and directed upward. The foul air is supposed to go out through a duct immediately below, at the floor level. The cry that opening a window in one of the schools with a "system" deranged the whole system proved, upon investigation, to be untrue, so far as the rest of the system was concerned. But if

the wind is in the wrong direction, the foul air from the other rooms will be forced into the room with the open window. This was guarded against by installing in the foul-air duct a register with a shutter, and keeping it closed. Next came the question of heat or no heat, and it was decided to have all the heat we could get, with the windows wide open from the bottom; open at the top made the floors too cold. Discomfort must always be avoided. Though frequently examined, the children's fingers were never found to be cold.

Smoke tests were made to determine the adequacy of natural ventilation. Flash powder was burned in different parts of the room, and the air completely cleared in from forty-five seconds to four minutes. The air was observed to come in at three windows and out at the fourth. The outlet varied with the direction of the wind. There was no cross-ventilation.

We removed all the seats and installed tables and chairs of suitable height and had room left for 20 cots, for we aimed to supply the trinity of childhood needs for growth—fresh air, food, and sleep.

Downstairs they gave us a room for our simple diet of milk, bread, and hot soup.

Then came the selection of the children: First a group referred by the school physician as anemic and poorly nourished. The worst of these were accepted, and then a rapid tour of inspection was made through the rooms, selecting here and there a child who looked frail.

Written consent to place the children in the fresh-air room being obtained from the parents, a physical examination was made, with clothing removed to the waist, and the defects recorded. Of the first 20, 12 had palpable cervical, 17 submaxillary, 7 axillary, and 7 inguinal glands; 11 had Smith's sign, showing enlarged bronchial and mediastinal glands.

There was an average of 5 defective teeth. Three of the children had heart lesions. The average hemoglobin was 84 per cent. (Tallquist). The average red blood-cells was 4,436,000. This was in sharp contrast with the tuberculous children, whose hemoglobin averaged 90, and reds 5,307,000.

Sputum examinations were made of children with cough; all were negative. Six gave positive von Pirquet reactions.

The first fresh-air room was opened February 21st, temperature out-of-doors 20° F. above zero; temperature in the fresh-air room, 45° F. All during the cold weather there was approximately 20 degrees difference between outdoor and indoor temperatures. Hourly thermometer readings in three different parts of the room showed a variation of from 2 to 5 degrees.

Daily hygrometer records were kept in the fresh-air room and in an ordinary school-room. The moisture in an ordinary room was constantly

from 20 to 40 per cent. less than in the fresh-air room, while the latter was from 5 to 10 per cent. less than the government record.

The daily routine of the class-room was slightly rearranged to provide for the rest hours, but no part of the regular school work was omitted. The lunches and rest occupied the time devoted to recesses.

One innovation that was a distinct advantage was the breaking up of the half-hour alloted for physical exercise into short periods of from two to five minutes after every lesson, and devoted to special corrective exercises suited to the round shoulders and relaxed balance common to these children.

Daily records were kept of temperature, pulse, stools, frequency of urination, sleep, and quantity of nourishment. The latter averaged 560 calories a day. For a part of the period records were obtained of the food consumed at home. In March and June the children were taken to the physiological laboratory of the Board of Education, and records made by Dr. McMillan, Director of the Child's Study Department: The height, weight, rate of growth, lung capacity, strength of grip, motor ability, and endurance as shown by Mosso's ergograph. These records were not made until the children had been in the fresh-air room for a month, and cover a period of seventy-nine days, showing the following gains: Endurance, 90 per cent.; motor ability, 8 per cent.; lung capacity, 5 per cent.; strength of grip, 3.4 per cent.

There was, during the period, a 25 per cent. increase in red blood-cells and a 9 per cent. increase in hemoglobin.

Previous school records for two years show 8 per cent. absence, while in fresh air these children were absent only 3 per cent. of the time.

In February they averaged 8.5 pounds below normal; in June, they were 4.5 pounds below normal for children of like ages. Of all the tests, the motor ability and ergograph are the most reliable. To estimate the motor ability the number of taps that can be made in ten, twenty, thirty, forty, fifty, sixty seconds are electrically recorded, and the point at which fatigue begins is noted. For the ergograph records, 7 per cent. of the weight of the child is attached to a cord running over a pulley, and fastened to the middle finger; the number of pulls made in ninety seconds, and the length of the pulls, are recorded on a moving cylinder as work done.

The mental improvement of these children was greater than the physical, and all were ready to enter the next higher grade a month earlier than those in ordinary rooms.

In spite of the extra food and sleep the children get in school, the parents all report that they eat better and sleep better at home, and that their dispositions are much improved.

METHODS OF SCHOOL VENTILATION

(By The Chicago Commission on Ventilation)

By W. A. Evans, M.D.

Chicago

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1. School-rooms should not be heated to a point above 68° F.

2. The thermometer should be located above five feet from the floor, on an inside wall, not closer than 6 feet to an air outlet.

3. The thermometer should either be suspended or so attached to the wall that it will record the temperature of the air, and not that of the wall.

4. The temperature of the school-room should be 60° F. as the pupils enter the room, after they have been taking exercise, and it should reach 68° F. within twenty minutes. The temperature of the school-room should be recorded each hour, and this record should be sent to the proper authority.

5. The air in the room should be kept actively in motion. A sense of stillness is always to be avoided. Electric fans for this purpose are advised.

6. During all recess periods the windows should be widely opened and the rooms "blown out."

7. The air inside should not be drier than that outside.

8. The air inside should be 50 per cent. to 70 per cent. relative humidity, and outside walls should be built with air spaces or other insulation so as to make it possible to reach this humidity before wall sweating begins.

9. Window sweating, so far from being a disadvantage, is a distinct advantage in that it softens the light.

10. Dust should be kept down in the school-room by using blackboard erasers which are faintly moist; by vacuum cleaning, or by opportune and proper sweeping.

11. With proper wall insulation very little heat is required for a school-room, even on days of zero weather.

12. All windows used for continuous air supply should be provided with deflectors, preferably of glass, placed at their bottoms. These should extend the width of the sash, and be so arranged as to deflect the air upward when the windows are open.

13. In buildings equipped with ventilating systems when the windows are raised to flush out the rooms, all rooms should be flushed simultaneously, in order to interfere as little as possible with the proper operation of the ventilating system.

14. In climates where the air must be heated before it is discharged into the room the simplest procedure is to take this air in through indirect radiation.

15. So far as we know, the best results are obtained by forcing the air through the indirect radiation by means of fans, delivering it upward in each room through a multiplicity of openings in the floor, and removing it at the ceiling.

16. Where fans are not used, the inlet to the rooms is best placed near the ceiling, with a foul-air outlet at the floor for use when heating the room, and a foul-air outlet at the ceiling for use when ventilating or cooling the room, the latter opening to have a device whereby it may be closed at will.

17. The method of ventilation known as direct-indirect, in which the cold air enters through openings in the walls of each room and passes through radiators, is effective only when outside conditions are ideal, and the use of this system, except as a makeshift, is deprecated.

18. Where school-rooms are heated by stoves, some of the air should be taken into the rooms through windows provided with deflectors. Some of it should enter through a duct in the floor and discharge around the stove.

19. Where steam is available, steam-jets should be employed to humidify. Where steam is not available, pans of water on the radiators, kettles on the stove, containers filled with water, or other moistening devices should be used around the room. These should be abundant. The usual small pan is not adequate.

20. People with the following diseases, either through contact or infection of the air, are capable of doing harm, and should be excluded from the room: Smallpox, measles, scarlet fever, diphtheria, whooping-cough, chicken-pox, poliomyelitis, cerebrospinal meningitis, influenza, colds, coughs, tuberculosis, typhoid fever, trachoma, itch, lice, and some others of no consequence in Chicago.

21. Where schools are ventilated by unsatisfactory methods, great improvement can be effected if to them the following additions are made:

(1) If fans or other forms of agitators are installed.

(2) If humidifiers are installed.

(3) If the temperature is kept at 68° F. or below.

(4) If the windows are raised and the air blown out at least three times a day.

22. Open-air schools are schools for tuberculous or other definitely subnormal children. In them the temperature and humidity are those of the open air. The only change from the straight open air is that there is some shielding from the wind, rain, and snow. The children in such schools require special food, special clothing, and special rest hours.

23. Cold-room schools are those in which there is some shielding against cold, wind, rain, and snow. The temperature should be 55° to 60° F. The relative humidity around 70°. Such rooms are for children that have enlarged glands, adenoids, or are pale, anemic, headachy—in a phrase, children who are moderately below par. Such children wear their own wraps during school hours. They do not need school feeding or nourishment more than other children require. They do not need an hour for sleep.

HEALTH OF SCHOOL-CHILDREN

By Helen Marsh Wixson

Denver

It would seem an impertinence for me—a lay-woman—to come before this convention today with any suggestions, were not the subject of Health of School-children one of universal interest, and one on which there should be universal intelligence—such universal intelligence that health may be regarded as a habit, susceptible to cultivation, and the effort to cure disease give way to the effort to prevent disease.

In order to spread the doctrine of health we are here today to take counsel, to seek out ways and means, and as the coöperation of lay-brothers and lay-sisters is of vital importance, I am here to give voice to a few convictions from the standpoint of an onlooker, but a deeply interested onlooker, to whom the welfare of the school-children of our country is particularly near and dear—an onlooker who is looking hopefully forward to the day, not far distant, I hope, when children will all be taught to practise the ways of health. Looking forward with the eyes of hope the future is full of promise, and I prophesy a more wholesome world than ours of today for our children. In it I see sunlight and fresh air and pure food and drink taking the place of medicine. I see a people living the beautiful outdoor life, and no longer striving to cure disease, but giving their best efforts to keeping well.

Does this sound as if I were prophesying a doctorless Eden? Perhaps it has a little that sound, for I am convinced that we need *prevention* rather than hospitals to preserve our nation, and the chief mission of you men of science, it seems to me, is to teach the conservation of our human bodies and the ways of health, and we all need education as to the supreme significance of this great work, for there is no justice or logic in hygienic principles that are only for those who are ill.

There are many far-reaching movements of reform today in which we are interested. We are learning that much of our future welfare depends upon a right comprehension of our present responsibility, and if deep and earnest conference is needed to conserve our material resources, how much more

necessary is it that we call together men of science, educators and leaders in the various walks of life, in order to counsel concerning the protection and conservation of human life. The conservation of the health of the school-children is worthy the closest study and the most serious thought, not only of those who are devoting their lives to the great study of health, but of every intelligent man and woman, and it is strange, in this commercial age, that the promotion and conservation of our richest asset—the child—should have made so little progress.

As a nation we stand today upon the threshold of a new era, and as we should, now and then, take a good square turn in front of ourselves, let us do so in this convention, and see if we are doing our full part in upbuilding the health of the greatest nation on earth.

Are the best men and women of our country striving with equal earnestness to preserve their personal existence and the existence of others? Are they taking as their watchword—coöperation?

No heaping up of wealth, no amount of culture, will avail unless, as a people, we have health. Even from the standpoint of mere financial needs *health* is what the whole business world is demanding, and as the merest business asset it behooves us to develop the health of our children, for health and reliability of character go hand in hand and reliability commands a high price in the markets of the world, and if we argue only from the standpoint of industrial efficiency, we shall find that ill health is not only a barrier to development, but an enormous clog to our social progress.

Every man, woman, and child in the United States should be taught how tuberculosis is communicated, also the quite simple measures needed for protection, for the old saying, "An ounce of prevention is worth a pound of cure," still holds good, and not until our country becomes educated will control of this dread disease become possible, for the solution of this problem lies in prevention, and prevention is education. This education must come, to a large extent, through the children. We are beginning to realize that our public schools are a trust, and that children, while under the supervision of the school authorities, should be safe from harm. We are also beginning to realize that efficiency rests not alone on education and intelligence, but is equally dependent on physical health and vigor, and the State must broaden its interest and responsibility, and if intellectual training is compulsory, make training for physical soundness no less so, and teach the children the measures necessary to avoid disease if our national health is to be preserved. From the lowest to the highest grades in our schools the laws of health should be taught, for the child of today is the citizen of tomorrow, and health is

fundamentally a moral as well as a physical question, and we should see to it that proper emphasis is laid upon the care of the body—teach that it is not a thing of evil, to be subjected to harsh discipline, but the home of the mind, and if the mind is to develop and come into its own, the body must be nourished and cared for. We do not expect, in this day of rapid travel, that an automobile will do good work—outspeed all others—without the proper care. The gasoline must be of the best quality, oil must be highly refined, and every bolt and bar be in place. Yet what do we ask of the human body? The gasoline may be of any quality, the machinery may go without lubrication, and bolts and bars look after themselves, yet we are surprised and aggrieved when we are outdistanced in the battle of life. We are like the man in "The Dawn of a Tomorrow," who took the Almighty to task for his faulty human frame, declaring that he could have made a better job of it himself, yet he did not know how to keep his own machinery going, and, after all, the Lord usually helps the man who helps himself.

One of the first requirements in our schools should be teachers who realize the relation of the child's physical condition to its school efficiency, for it is clearly demonstrated that failure in studies, nervousness, apathy, dulness, and much viciousness on the part of children are the direct results of ailments that are easily curable. As an illustration let me refer to a recent medical examination in New York, where, out of 37,190 first-year pupils, 69 per cent. were found defective; of 97,543 unclassified pupils, 66 per cent. had defects, and of 169 average pupils, 84 per cent. were ailing. These figures alone go to prove the importance of systematic and scientific examination of school-children.

Out of the 41,546 children found defective in Colorado, defects of sight existed in 26,978, hearing in 6155, breathing in 8045, and other unclassified defects, 21,825. There were 3071 mental defectives and 746 moral defectives.

It is an established fact that in communities where special attention is given to physical examinations in schools the work is of high standard, the general health is greatly improved, and infectious diseases reduced to the minimum. In making this statement I say the conditions are due to "special attention," and by "special attention" I mean expert medical inspectors, for in many of our cities such are employed, as well as a corps of registered nurses who are assigned to particular districts and work with the directors of physical training. Boston blazed the way for the entire country by adopting, in 1894, a system of medical inspection, and in a recent report received from there I find 1131 cases of defective vision corrected through

inspection, as well as many other cases handled, and, best of all, 7559 home visits made by the nurses, but Boston is an exception, or something of an exception, and what of the other cities that have so-called "physical examinations" without the aid of specialists? In them we find the teachers doing the work of a trained medical expert. We demand of them the enlightenment that will enable them to watch the physical condition of the children as carefully as they do, or should do, the mental, and, like good engineers, they are expected to give instant attention to danger-signals.

In 1910, 158 cities reported medical examinations. Out of this number 337 had real medical inspection; 76 cities had school nurses; 1194 school doctors were employed; 371 school nurses, and 48 dentists.

In general the medical inspection of schools aims first to detect communicable disease, and, second, to discover the physical defects of individual children, and but 301 of our cities have a system for the detection of contagious diseases.

There are in Colorado 222,983 school-children, and from the number in this State alone an estimate of the task imposed upon our teachers may be made. It would appall many physicians, and the average "interne" would call for help, yet in many of our States this hard and unpleasant duty is forced upon the teacher, and the physical welfare of the children is so placed in the hands of utterly inexperienced people, and people who have little time—we see to that by our other demands—to prepare for physical examinations, of which they very naturally have not the slightest knowledge, and from them we expect opinions that are right. To be charged to such a degree with the welfare of humanity is an awe-inspiring responsibility, and no question is more liable to stupidity than that which concerns the physical welfare of children.

Not long since the principal of one of our large city schools told me that she herself had examined some 400 children. It goes without saying that she was a nervous wreck, for she had been most conscientious and intelligent in her endeavor, and what was the net result? What could it be? Could a teacher lacking in all medical knowledge be expected to diagnose those 400 cases? Defective eyes, ears, adenoids, pneumonia, or the first dread signs of tuberculosis might have been present in those children, but how was the overworked, overwrought teacher to detect them, no matter how conscientiously she tried? She simply did her best, and then compromised by becoming infected with one of the diseases she blindly tried to detect, and called in a physician to diagnose her own case. Questions of this kind can be settled only by a medical expert. They certainly ought not to be—

indeed, they cannot be—settled by a teacher alone, and every Board of Education should provide expert medical advice.

Another evil of the system of inspection by teachers that prevails in many of our cities is that the poorer children, when found in a condition that cannot fail to proclaim itself even to a "medically" ignorant teacher, must be sent to the public dispensary, where they get "short shift," or to a physician of doubtful ability, and the proposed cure is sometimes worse than the ailment. If you doubt this, keep track of cases of enforced vaccination in the slums of any city. Keep track for a little time of the cases sent to these public dispensaries, and to the so-called physicians who prey upon the unfortunate and poor, appealing to their credulity and hope and sum up the result.

It is time for us to have a little sane legislation regarding physical examinations in the schools—time for us to relieve overburdened teachers by giving this work to specialists and trained nurses, and while about it why not set up a minimum standard of clothing, cleanliness, nutrition, and education, and if the standard is not maintained by the child, make the parents responsible?

Japan, the country that, according to one of her statesmen, was obliged to "kill a few men" in order to take her place upon the map of the world, employs some 9000 specialists as medical inspectors in her schools, and their knowledge and rigid enforcement of the laws of hygiene are held to be the real cause of the Japanese victory, rather than the poor marksmanship of the Russians.

Who, after all, are responsible for the children? We are a great people. We do things in a large way. Then why not invest a part of our energy and income in saving the boys and girls? Between 6000 and 7000 schoolchildren out of every 100,000 die of some form of tuberculosis each year, and "Rachels mourn and refuse to be comforted."

The fact that we are facing conditions that had their origin long ago does not in any sense justify neglect of the present conditions. Our obligation to reduce this death-rate, to transform this generation and the coming generations through education, remains the same. It is left to us to lift the burden from the children. Keep helpless little ones from the wrong of lack of care and improper care. Teach the lame to walk and the weak to become strong, and strip heredity of its terrors.

Right here in Colorado, during 1910, there were three times as many deaths from tuberculosis as from the well-known infectious diseases, smallpox, measles, scarlet fever, diphtheria, and typhoid fever. Yet we can

no longer plead ignorance, for a campaign of education has been waged by the State associations for the cure and prevention of tuberculosis the length and breadth of the land, and we have gained knowledge, and with knowledge has come responsibility. In the ignorant past we looked on the terrible work of tuberculosis with the eyes of the fatalist, and turned away in hopeless despair. But today we are inspired with a new hope. We realize that if tuberculosis is a communicable disease it is also one to be prevented. We are seeking out infected homes and school-houses, and are locating the enemy, that a rational campaign may be conducted and the enemy routed, and to you men of science, who have worked so long and faithfully to bring us knowledge, we owe a debt of gratitude. How much you have accomplished is illustrated by this great convention, for it is one of hope. While you have taught us our danger, you have also taught us the weapons to use in our battle, and we realize that the dread "white plague" is growing less with the years, and that even those who face the heartbreak of infection now hear a whisper of hope.

The price of bodily efficiency may seem high, but the result is worth the effort, and we must write health as a habit upon the school-children. We must preach the gospel of fresh air, cleanliness, and nutrition to them.

We must raise the standard of our playgrounds until they have attracted the attention of all our public authorities and become a part of our school system. And who can foretell the battles to be won on the playgrounds of America—the weak made strong, courage kindled, manhood roused, self-mastery won? We must teach the result of overheat and lack of exercise, and that children can exercise all day in heated rooms without the slightest danger of becoming physical giants. We must teach that germs, even very active ones, die in the sunshine, and that soap, water, and sunshine are good disinfectants. "Where the sun does not go, the doctor does," is an old proverb, and few disease germs can survive the sun-bath of the playgrounds.

There are 17,061,962 children of school age in the United States. Let us establish a "Health Day" in every school, where we may extol the advantages of health. That would be progress, and progress is what we want, not simply reform.

My subject does not include "open-air schools," but I must say a word of this school of the future, in which there will be neither feeble-minded delinquents nor tuberculous children, and the truant will be unknown. The result of these schools has already been an appealing object-lesson in outdoor life.

Not long ago our State Association had an exhibit here in connection with simple and helpful lectures. The schools were invited, and each had a time set apart when everything was explained. Some time after a colored boy of fifteen, whose mother was a victim of the dread white plague, went to his teacher to ask her advice as to the precautions he was having put in operation in the family. Without the enactment of a law prohibiting the common drinking-cup, the law we passed this last session of our legislature, and still rejoice over, that boy had abolished it in his home and put in practice the methods that were to save his brothers and himself from the fate of their mother.

This fall, as "busy work," little children in schools all over our State are to make the little paper drinking-cups that proclaim that the hold of tuberculosis is loosened. They will be taught why, and when children are taught, parents are taught why, and the battle is more than half won.

It is time for a new American Revolution. We no longer believe that tuberculosis is incurable. Let us stamp out the health-destroying trust. Let our government take part in the great revolution by establishing a standard of sanitary conditions in homes and schools, and making it not only illegal, but punishable, for a man to take his family into a house or send his children to a school that falls below the standard, for every child is entitled to good food, fresh air, a cleanly home and school, and to a chance to grow to maturity free from the blight of disease. Legislation of this kind would bring results that nothing else can bring.

Here is a good health program, recommended by the Nebraska Association of School Principals and Superintendents:

"Compulsory installation, in school-houses, of ventilating heating plants.

"Compulsory cleaning and disinfecting of school-houses at least twice a year.

"Compulsory medical inspection of school-children.

"Compulsory submission of all school-house plans to the State architect for approval.

"Compulsory medical inspection of all school-teachers."

SCHOOL HEALTH AND HYGIENE EXHIBITS

By John B. Hawes, 2d, M.D.

Boston

I have called the exhibits and charts here described "Health and Hygiene," rather than "Tuberculosis Exhibits," for two reasons: (1) There still exists, and will continue to exist for a long time to come, a very strong, and to my mind not altogether unreasonable, prejudice against allowing children to be taught or shown anything that has to do with death and disease—even its prevention; (2) the lessons to be taught the children by such exhibits and charts belong really to the broader subject of health and hygiene, and deal only indirectly with tuberculosis.

That the present teaching of hygiene and the rules of health in our public schools is either absolutely lacking or woefully inefficient cannot be denied. No amount of studying or reading, even from such excellent school-books as the Gulick "Hygiene Series," or talks from teachers, however well delivered, can impress upon children's minds what can be easily and strikingly shown by a few simple pictures, photographs, diagrams, or charts. I have never forgotten the pictures of the interior of the stomach of a man whose habits were, to say the least, not temperate, shown me by the principal when I was in one of the lower grades of the grammar school; there is no reason why pictures and charts far more instructive and infinitely less gruesome, or, better still, cheerful and pleasant, should not be impressed with equal force on the minds of children of today. Dr. Charles W. Eliot, in a recent address, called attention to the fact that our methods of teaching young children must be changed and that advantage must be taken of the fact that children can absorb and profit by what they can see long before they can gather much from reading or listening to others read or speak.

Prior to the year 1908, in Massachusetts, there was little or no teaching of hygiene or prevention of disease in our public schools. During that year, however, the legislature passed a law which made it compulsory that tuberculosis and its prevention should be taught in the schools. To supplement this law a committee of Boston physicians, at the request of the State Board

of Education, prepared a short pamphlet on the general subject of tuberculosis, a copy of which was placed in the hands of all school-teachers in the State. I doubt very much if the passage of the law, good in itself, accomplished anything more than to add to the burdens and perplexities of the already overworked school-teacher. The need of some step of a practical nature was evident. Two years later, in 1910, the Tuberculosis Committees of the Massachusetts Medical Society introduced a bill into the legislature calling for an appropriation of $1000, to provide for a small number of tuberculosis exhibits. This bill was passed, and the preparation of these exhibits fell largely into my hands, as secretary of the Board of Trustees of Hospitals for Consumptives.

The requirements of an exhibit intended to teach school-children certain facts concerning tuberculosis, health, hygiene, prevention of disease, etc., are, in my opinion, somewhat as follows: (1) The exhibit must be comparatively inexpensive, so as to be within the reach of towns and cities whose appropriation for school purposes is limited. (2) It must be compact, so that it can be easily set up and transported from school to school and from room to room. (3) The lessons it teaches must be of the simplest and most striking character.

I have tried, with what success remains to be seen, to meet these requirements as fully as possible. Our exhibit, as finally constructed after months of planning and experimenting, consists of a single large frame, about 5 feet high, 4 feet wide, and 4 inches thick. This frame is built of light but strong wood, and opens like a book, with pictures, mottos, etc., arranged on the inside of each cover. There are strong hinges on the back, brass protectors for the corners, and simple clasps in front, so that the whole thing can be shut up, locked, labeled, and easily expressed to its destination. It can be moved about the room by one person, and can be easily handled by two men.

The exhibit consists of 48 8- x 10-inch frames, which contain mottos or photographs. There is a row of mottos along the top, and a similar row along the bottom. The pictures in the column underneath each motto are intended to illustrate what is said in that particular motto. For instance, underneath the first motto, " Crowded tenements where the windows are kept shut, where dirt and darkness abound, are breeding-places for consumption," are four illustrations of the worst sort of tenement rooms. It is perfectly simple for any teacher to demonstrate what is wrong in the living conditions here shown, and to demonstrate what should be changed to make them better. At the bottom of this column is

the motto, "Health is the poor man's stock in trade. A tenement with sunshine and good air at four dollars per week is cheaper than one without at three dollars per week."

The next column takes up the subject of dusty and dangerous trades, and the part they play in producing tuberculosis. The motto at the top reads, "Tuberculosis breeds in dusty, dirty, and badly ventilated workrooms and factories. There is no danger of tuberculosis in a properly ventilated and well-aired workroom." Pictures illustrating this show men at work at granite cutting and in an iron foundry, with clouds of dust, a dirty and poorly ventilated bakery, and, last, a machine-shop with ideal conditions, where there is plenty of fresh air and light.

Other mottos call attention to the need of fresh air and sunshine, open windows, cleanliness, etc., and are illustrated by pictures showing methods of getting fresh air at home by means of balconies, tents in the yard, tents on the roof, etc. There are two very striking pictures showing how milk is contaminated. A typical tailor sweatshop is compared with a room where conditions are as they should be. In the right-hand panel mottos are devoted more toward the prevention of disease, and are planned to demonstrate what children should do to keep healthy and strong. Such mottos as "Keep the body clean and a cheerful mind; worrying doesn't mend matters"; "Take time for regular rest, exercise, and recreation: you will do better work"; "The best way to treat tuberculosis is to avoid getting it"; "The children shown in the pictures have not got tuberculosis: they are learning how to live so as to avoid getting it in the future"—are illustrated by photographs of public baths, playgrounds, outdoor schools, and children taking their exercises out-of-doors, while attending our ordinary public schools.

The frames are firmly screwed into place, and the pictures are covered with celluloid, rather than glass. The total cost of this exhibit is thirty-five dollars. Out of our appropriation, 20 such exhibits were made. A pamphlet entitled "School Tuberculosis Exhibit; Suggestions in Regard to its Use and Demonstration," was prepared by the writer, and issued by the Board of Trustees of Hospitals for Consumptives. Copies of this pamphlet in sufficient numbers are sent along with the exhibit. These exhibits have been distributed throughout the State as widely as possible. Wherever possible, we have urged the local anti-tuberculosis association, under whose auspices, in almost every case, the exhibit is managed, to buy the exhibit outright, thus providing us with funds to build others. Where this could not be done, the exhibit has been loaned for a period of months sufficient to demonstrate it in all the schools. Nearly all the 20 exhibits built from the

original appropriation are loaned in different towns and cities in the State, while an equal number have been bought outright by various anti-tuberculosis associations.

I have tried to make it clear to every one to whom we have either loaned or sold an exhibit that this is only an experiment, and that in many instances changes and modifications should be made to suit local conditions. The ideal plan, in my opinion, for the demonstration and use of such an exhibit, would be somewhat as follows: The exhibit is sent to a certain public school. At a given time arrangements are made with some physician well acquainted with the subject, to meet the teachers and to explain and demonstrate the exhibit to them. It should then be set up in a school-room, where it can be examined by the children in their leisure hours and demonstrated to them in small groups by the teachers, or, better still, by the school physician or school nurse. After one class has made a careful study of it, the children should be given an examination, based upon the lessons which they are supposed to have learned. The exhibit should then be sent to another room and the process repeated.

In order to get further information for future work along this line I sent a circular letter to all those who were using our exhibit, asking their opinion as to its value, and suggestions as to how they would change or add to it. All my replies were unanimous in stating that the exhibit was of very great practical value. Worcester qualified this statement by saying it was good for pupils in the high school and down to the seventh grade of the grammar school. Clinton likewise said that it was not of value below the seventh grade. Fitchburg believed its value to be very great, except to the youngest children. There was a general consensus of opinion that it was hard to handle and move around, and many seemed to think that, with fewer and larger pictures, it would do better work than in its present form; many made the suggestion that certain of the pictures could easily be enlarged, and placed either on cardboard or linen backs, so as to be hung up and separately demonstrated. The Boston Tuberculosis Association has had the pictures in the exhibit colored, which certainly adds to its attractiveness, but also to its expense. The Boston Association has also had a small stand, about one and one-half feet high, made, on which to place the exhibit.

From my experience with this exhibit so far, and from a careful consideration of the replies sent in answer to my circular letter, I have come to the conclusion that at least two different grades of exhibits are needed—one somewhat the same as the one here described, but altered or added to in order to meet local needs, where there are photographs of actual conditions,

and another form of exhibit infinitely simpler, in which, by means of striking diagrams (not photographs), lessons of the simplest nature are taught. A committee of the Boston Association for the Relief and Control of Tuberculosis is now at work planning "health charts" according to this idea. These charts, as now planned, will consist of a dozen or more sheets of paper, at least 2 x 3 feet in size, backed by linen, and fastened together at the top by a wooden rod. On each sheet there will be one motto, illustrated by a picture or two contrasting pictures, in at least three colors. Such a chart, with 12 pages, attractively gotten up and decorated by any large lithographing concern, would cost under five dollars after the initial cost of preparing plates, etc., had been met.

The advantages of such a chart for young children are obvious: (1) It is inexpensive. (2) It is easy to demonstrate, and requires little or no technical knowledge on the part of the teachers. (3) It is light and easy to handle, so that it can be hung over the front of the teacher's desk, on a wall, or in any other convenient place. (4) It is simple, and will not confuse young children's minds by the multiplicity of ideas presented. (5) If properly prepared, with but a single fact to be learned on each page, it will teach things worth knowing in as forcible a manner as the picture of the alcoholic stomach was impressed upon my youthful imagination.

DISCUSSION ON PAPERS BY DR. AYRES, DR. McMICHAEL, DR. EVANS, MRS. WIXSON, AND DR. HAWES

Dr. R. W. Corwin, Pueblo, Colo.: I do not want to see the subjects go without discussion. The excellent papers which we have heard today are certainly of benefit to us. I am delighted to know about the schools in Chicago. I have kept track of them somewhat through the periodicals, but I am glad to hear directly from them. I am sorry that we could not have Dr. Evans with us today. We all know what he is doing. He is a good friend to everybody who wants to do right.

Now one word about schools: For twenty-five years I have been on boards of education and have taken much interest in school work. I am a little cranky on some things,—I have been accused of that, at least,—but I have tried to get people to look at things my way and I have succeeded—"nit." The one thing that I have tried to do was to have a school that would be what we call the "individual school"—the "unit plan." When I spoke to some people in New York about it they said they could not do it in New York city—that they could not erect a school of the type I had suggested

in cities, where the ground is so expensive. They cannot in Chicago either —if they do not try. The school of which I speak, the unit plan, is a simple building about which some of our Colorado people know. I have preached it enough, and they will pardon me if I mention it again. The building is a central building, which contains the heat in the basement, and small buildings are added as needed. These abominable buildings, which go upstairs a number of flights, are simply criminal. I am glad I am getting some applause here—I cannot get it at home.

I am down on stairs in a country where the land is inexpensive, and I am down on them in cities where they can spend so much for a baseball field,—and I like baseball,—or where they can plow through a street to put up a "pass-over," as they have in Brooklyn. I say that they can make room for schools if there be a desire, and the school-ground might be a park for the city—a breathing-place. And, as I said to Mrs. Harriman when she was speaking upon the hospital question, "When you want to build such places you can," but she said, "The ground is so expensive that we cannot." I said, "Why not go up to the Bronx and buy your ground now for a hundred years ahead, and not, when your hundred years come around, feel sorry that you did not do it a hundred years ago."

Stop to think that when we have stairs, when we build steps, we build them the same height for a man who is six feet tall and a child only half that height—think of it! They are convenient for us, but what must they be for a child only half our height? Now, they say it is good exercise for a child to go up steps. How is it with the child who has heart trouble? How is it with the child who is lame, sick tomorrow and perhaps well today, the child not fit to climb stairs tomorrow, although perhaps able to take that exercise today?

I have answered the question by saying that if they wish to have children take exercise, for Heaven's sake go out and build stairs in the yard and make the children climb them when they are well, but do not make every child go up stairs simply because somebody has a cranky notion that every child should be made to take exercise by climbing.

The incline, if you must have two stories, will overcome that whole problem, and then the lame and the sick, and the heavy and the weak, and the well may take short or long strides at will. The elevator is suggested in place of stairs or the incline, but an elevator is never safe from fire. It is a good fire-trap under all circumstances.

The unit building of which I speak may have light and ventilation on any or on all sides. It permits the child to be taken out-of-doors at the

will of the teacher, when the weather permits, without disturbing those in other rooms. Fewer children are together, hence less chance for disseminating disease, and, in case of fire, less loss of property and no risk to life. The incline in a two-story building is a joy for the well and is life-saving for the ill.

A. E. Kepford, Des Moines: I certainly want to commend the papers which have been read before this section this afternoon. In the combat against tuberculosis, in my judgment the most important discussion which has taken place has taken place this afternoon. It is my own contention in the State of Iowa that it is necessary to increase the resisting power of the bodies of subnormal people, particularly children. In order to combat the infection of the tubercle bacillus I believe that the fundamental thing, or one of the great fundamental things, is the proper care of the school-child, and I have been exceedingly glad to know of the experiments which have been carried on in Chicago and New York in open-air schools.

I believe the solution of tuberculosis lies in the contributory influences, rather than in the specific fight upon the specific germ. You have to have resisting power in the body of the individual, for if that individual comes in contact with the germs of tuberculosis, he is bound to become infected with them unless he has a normal resisting power which is able to meet and combat the disease. The increasing of resistance in the bodies of children is an exceedingly important thing, and I believe that medical supervision of the children of the public schools of our country is a fundamental thing in the combat against tuberculosis. I feel also, ladies and gentlemen, that those who today are making an effort to disparage this movement, to cast opprobrium upon it,—and I am speaking now of a League which has been formed for this purpose,—that to cast opprobrium upon this movement means to discourage one of the greatest, most fundamental and basic principles in the combat against this dreadful scourge, for we must depend upon the strong body for resistance against this disease.

Seymour H. Stone, Boston: Since the Chairman has now thrown all papers open for discussion, and as I am familiar with the paper of Dr. John B. Hawes, 2d, through lack of time read by title, I therefore wish to discuss some aspects of this paper.

Dr. Hawes and I are both interested in a very simple plan of teaching school-children the rules of health, and for that reason I have brought on from Boston the chart or cartoon which hangs here upon the wall, and which is merely one page of five or ten sheets. It is supposed to be dem-

onstrated by the school-teacher or nurse, and can be shown in somewhat the same way in which Dr. Ayres has shown his charts, attached to a music-stand. The chart can be rolled up or folded and taken from one room to another. It presents in a graphic way the rules of health, the desirability of fresh air day and night, the evil of poor living conditions, and is entitled "Consumption and other diseases breed in dark, dirty, crowded rooms." Below this might be depicted the same room, or a similar room, rearranged under proper conditions. The title under this should read: "Disease germs cannot live in clean, airy, sunny rooms." The furniture in this room, by the way, is very simple and cheap.

We might, in addition to a sheet of this kind, have one showing the picture of a clean bakery, with screens on the windows and over the food, and as a contrast another representing a dirty shop, with sputum on the floor and flies everywhere on the food, in cans of milk, etc.

Still another might show children exercising out-of-doors, with the statement that exercise and fresh air are good for all school-children; that the care of the body is as important as the cultivation of the mind. This last sounds strange, perhaps, coming from Boston, but, nevertheless, we are beginning to feel that it is true.

Another chart might be entitled "Fresh-air rooms and outdoor schools," with a picture of two or three such schools. And another, "Observation of the laws of hygiene and right living; soap, water, and a rough towel tend to prevent disease." In this connection we might give a picture of a child taking his morning bath.

Another might have the title "Neglected and decayed teeth cause disease," with a picture underneath of a tooth-brush, tooth-powder, and brush and comb, labeled, "Of course you have used these this morning."

These are mere suggestions, and have not been worked out fully. We found, on looking into the matter more carefully, that it would be quite expensive to lithograph pictures of this kind. This one, being in four colors, I believe, would cost something like 61 cents to produce. But if the work could be done in lots of 1000 it would be cheaper, and in 5000 lots cheaper yet. In Massachusetts we could not dispose of very many, but we felt that if the National Association, or perhaps the Russell Sage Foundation, thought well of it, they might take the matter up and distribute these pictures throughout the country among the school departments and also in the open-air school-rooms.

I should be very glad of any suggestions or criticisms of this plan.

THE RELIEF OF FAMILIES IN WHICH THERE IS TUBERCULOSIS

By H. Wirt Steele
Baltimore

It is a splendid thing that those of us who are executives, members of committees, councils, or boards of directors of tuberculosis activities can be reminded, as we were at the meeting of the National Conference of Charities and Correction in Boston last week, that in cases of poverty caused by tuberculosis, as in all cases of poverty, whatever their cause, we are dealing in matters of relief with the problems of the family, first, and the problems of the consumptive, second. The family being the social unit adopted by all philanthropic agencies, its treatment is necessarily, then, of first importance. In these relief problems we are dealing with families that live in houses, wear clothes, enjoy the smell of good food, are accustomed to have their bread-winners go to their jobs in the morning and come home at night, and have their various forms of pleasure and recreation. All these wants, or any of them, being unsatisfied, from lack of ability to satisfy them, give rise to problems of charitable relief.

It is in discussions such as this that we are reminded of this point of view by social workers in other lines, and we are enabled to give our point of view to them, and so work out between us a sane and conservative program of progress toward the elimination of tuberculosis and its attendant suffering, poverty, and distress.

Those of us engaged in the campaign against tuberculosis as our principal occupation have been accustomed to think in terms of the death-rate. We think in large numbers: we keep constantly before us, as in the State of Maryland, for instance, the fact that there are, by conservative estimate, 10,000 living consumptives in the State; that there are 2500 deaths from tuberculosis each year,—and we set over against this the fact that we have sanatoria beds for 250 incipient cases and hospital room for 300 more,—and we are very apt to lose sight of the facts of intense human necessity in the homes and lives of these tuberculosis patients. But that our program may

bear the finest fruit, I wish to make an appeal to each tuberculosis secretary, to each medical man or layman engaged in the tuberculosis campaign, to keep everlastingly looking for the incidence of tuberculosis—bring our knowledge up to date continually. I do not believe we can do this unless we keep in very close touch with the charity organization workers, the relief societies, children's agencies, prison associations, sex hygiene committees, psychiatric societies, and the administrators of institutions. They are seeing the effects of tuberculosis as a cause of dependency and delinquency in the individual cases, while we are looking at the problem in the large. When questions concerning the policy of relief arise, we can reach a just and equable solution only after getting their points of view.

Let us take a hypothetical case record. Here is a card which bears on its face this information: "Smith: John, Mary; ages, fifty-five, fifty-three; four children—boy eighteen, girl sixteen, girl thirteen, boy nine. The man is a machinist, with earning power of $90 a month; the card indicates that the woman's occupation is that of housewife; the oldest child, a machinist's apprentice, earning $28 a month; the girl of sixteen is in high school; the thirteen-year-old girl is in the seventh grade, and the boy of nine in the fourth grade. The card is dated two years ago. Before the address, at which the family were living at the time the record was started, there was but one previous residence; that was in another town, quite a number of years ago; there were only two or three relatives who were traceable, only one of whom lived in this city. The man was a member of a secret society and the International Association of Machinists; the woman was a member of a Protestant church. In the blank space reserved on the card for the source of application or first information appears the name of a well-known local physician, and in the space reserved for cause of distress appears the word "illness." Now, let us turn the card over and get the running story on it of the agency to which this application was made, and which we may assume is carrying on a plan of treatment for this family. The record indicates that the physician called up the office and explained that here was a very self-respecting family of nice people; the husband and father had been ill for six months; their lodge and union benefits had about been exhausted; there had been very little savings, and that they were about all spent; the husband had typhoid fever, contracted from the drinking-water supplied the employees of the large machine-shop in which he worked; he had never seemed to get strong after his long illness, and priding himself that he was a wise physician, with some knowledge of the social needs of his patients, he had thought best to call the attention of this philanthropic agency to this

family's condition, and that they might have a friend in this large city who would come to their rescue with charitable relief very soon.

Now, there is a statement of the case teeming with problems for the social worker. Up to that point the information was perfectly definite, but to the trained social worker there will at once occur many questions that ought to be answered before it can be said that we have a fairly complete, basic statement of the whole problem. The investigation which was set on foot immediately began to answer some of these queries, and the nurse who visited the family suspected that the man had developed tuberculosis. At least it was suggested to the mind of the investigator to find out if it were true. The physician who had been attending the family could not give a satisfactory answer as to whether the man was a victim of tuberculosis or not, so the help of a dispensary was obtained, and here a positive diagnosis was made.

Now, where and how does this new fact, added to this record, so change the complexion of the problem of material relief for social treatment that on it should hinge the decision as to what kind of a charitable agency should administer that relief or assume the charge of that treatment? For the individual man, yes; but how does it vitally alter the situation as regards the problems of the whole family? Is there any wide-spread difference of opinion on this point, or are we not all fairly well agreed that it is a function of a charity organization society to plan and conduct treatment of the family, and that it is not a function of a tuberculosis agency to do so? Such a difference of opinion does exist in spots, I know, but that it is wide-spread, I doubt. Where it does exist, it may possibly be explained, as was suggested by Mrs. Ada T. Sheffield, of Cambridge, who, as a member of a Massachusetts Commission which was authorized to investigate and report upon the problem of relief in tuberculosis, wrote a minority report, and after pointing out this difference of point of view, charged it to the difference of professional training of the physician and the social worker.

"The doctor," she said, "is habitually called in to take charge of a situation that presents more or less of a crisis. For a short period he carries a personal responsibility toward his patient's family that should vest him with authority to direct them in carrying out his plans. The emergency warrants both him and them for the time in ignoring some of the general claims of the public. The doctor's whole activity and concern are centered upon the patient; he must draw on all his resources to get that one man well. He does not need to consider the rest of the community, because the nature of the treatment he gives his patient is not ordinarily affected by the fact that

the latter is one of a group. The social worker, on the other hand, deals with a situation that is likely to continue through years. He habitually looks forward to a long pull, and while he does everything in his power to help the individual, as one of a group and the group a part of the whole public, his treatment of the individual case is always modified by that conception. He has always to remember that justice is due to the rest of the community, as much as kindness to the single person."

Let us go back to our hypothetical case. While the physician in charge apparently did not recognize tuberculosis, he did seem to have a sense of the long pull to come, giving rise to a situation with which he was not able to deal "single handed." But even if he had recognized the disease, would it not have been wiser? Would he have been discharging his whole responsibility if he had personally made arrangements for the treatment of the patient as a consumptive, and had done nothing more looking to the relief of the family? The family would just as surely have become dependent if the man's illness had been simply the after-effects or a continuation of the fever, as it did with tuberculosis present. My contention is that the presence of tuberculosis only added one element to an already complex charitable problem, and that it is a function of the society or agency established for the purpose of organizing charity in a community to deal with this family's relief problem.

Now, let us see how our machinery for dealing with the relief of tuberculosis has developed. It was assumed in the beginning, by most of the State and local societies for the prevention and relief or the study and prevention and control of tuberculosis, that their chief function was an educational one, and that the raising or administering of relief in individual cases was not a proper function of theirs. As a very natural result of the early work of these societies a great many cases became known that were not previously known, either to the patients themselves or to the community. We believed, then, that special diet for these sufferers would help solve the problem. We believed that home treatment might go a long way toward the cure of many early cases, and so reflect its value in a decreased death-rate. We looked at our inadequate sanatorium and hospital accommodations in a rather hopeless way. As I said, we were looking at the problem in the large, and we could not possibly see how 500 beds could be stretched to make a very effective plant for the institutional treatment of 10,000 sufferers. We employed trained nurses to make a new specialty in that profession; we call them tuberculosis nurses; they were to deal with individual cases. It was their job to so teach, conjole, or force patients to be careful that the

homes where they were left would cease to be foci of infection. They were not long in discovering that, with what weapons of law and right principles they were equipped, it was not enough; the great majority of patients simply would not be careful. Partly because she was brought face to face with the lack of sufficient food and partly because she felt that, by furnishing special diet to the consumptive himself, she could influence him to follow her instructions as to the care of sputum, sleeping outdoors, lying down in the afternoons when there was temperature, and the dozen and one other things which her instructions embraced, the nurse very early began to use special diet, getting it from whatever source she could. The source to which she naturally turned first was the regular relief agency of the community, and I have known instances where the budget for sick-diet of such an agency increased each year by thousands of dollars, due wholly to the additional diet given to consumptives on the recommendation of physicians and nurses. A few years of this wholesale relief, however, was sufficient to show that the problems of relief of poverty and distress cannot be dealt with by wholesale; that each family is a unit; that each family requires a definite plan for itself, and that no one prescription of diet, as no one prescription of drugs, is suitable for any considerable number of cases. So in those communities where the relief was administered under the direction of the nurse or the tuberculosis agency the pendulum has swung back in almost every instance, and the amount and kind of relief is again determined by the relief agency.

This question of relief and its administration was deemed of sufficient importance to be given a special prominence in two conferences, organized by the Russell Sage Foundation in 1910, one in Boston and one in Baltimore. I have before me the printed proceedings of the latter conference. It was based upon a questionnaire which had been prepared and submitted to those taking part in the conference beforehand. Some of the questions discussed were the following: "III. In the case of sanatorium or hospital care of a bread-winner, what responsibility must be assumed by both medical and social agency? IV. What must be the basis of real coöperation between medical and social agency? Can the one demand of the other, or must there be a joint working out of the joint problems? X. Can we permit the presence of a rough or drunken husband or son (who should be the chief bread-winner) in a family where relief is required? If we can, how can we prevent worry and distress of mind on the part of the patient, misapplication of milk and eggs, and general breakdown of plans? XIII. Must not all relief given in form of special diet be a part of a plan between medical and social agency which sees that diet is protected by adequate additional relief

in some cases, and the diminution of both mental and moral factors which may drag down the patient with the family to destruction? XIV. In cases where relief is necessary, should not the family and relatives make all possible sacrifices provided that it does not mean the undermining of anybody's health to provide diet or other relief? Should not their natural resources of relief, such as employers, old friends, etc., be also used as far as possible as in ordinary cases requiring relief?"

I think you will agree that these questions in the main indicate their own answers. In answer to the first, the consensus of opinion seemed to be that there should be a division of labor according to natural function between the two agencies; in reply to the second, that it was not fair of either to demand of the other, but that there should be a joint working-out of a joint problem, further, that it was not wise to utilize sick-diet as a club or a lever to force patients into a sanatorium or to observe the rules of the nurse—the fact is that very much of the sick-diet that had been given had been misapplied and the patient had not received it. Other members of the family ate it, and in some instances it had been sold and the money used for hurtful things: in short, that a great part of the money spent for such diet had been wasted, and the discontinuance of that kind of relief has been rapid.

Instead, we have begun to work out a constructive policy in which the matter of relief in each case must depend upon the social and economic conditions found there by trained social investigators, and administered by the same agencies and in the same manner as though the cause of distress were any one of the hundreds of incidents of life that naturally come in that category.

DIVISION OF FUNCTION

Now as to the division of function between tuberculosis agency and the relief agency: A special committee of the Charity Organization Society of Seattle, Washington, recently made a searching inquiry in eight of the principal cities of the country, to determine just where, in the scheme of the philanthropic agencies, the problem of relief would or did fall. I present here a summary of the results of that inquiry.

Speaking as the secretary of the National Association for the Study and Prevention of Tuberculosis, Dr. Henry Barton Jacobs said: "In most communities the anti-tuberculosis league undertakes little beyond educational and preventive work, leaving relief work almost entirely to other agencies. In this way it seems to me the anti-tuberculosis league is likely to achieve its

greatest efficiency, inasmuch as it cannot be prepared without duplication of effort to furnish the relief measures which the charity organization society and other agencies are likely to be supplied with."

Dr. Livingston Farrand, the executive secretary of this Association, laid down the following dictum: "As a general working principle the function of an anti-tuberculosis association should be educative and stimulative, and relief problems should be left, as far as possible, to the Charity Organization Society and other agencies. If these do not exist, relief problems should be turned over to these agencies as soon as they become available. This principle applies to dispensaries, sanatoria, and other foundations of the kind."

"The sentiment in Boston from the first," writes Miss Alice L. Higgins, secretary of the Boston Associated Charities, "has been that the best good of the community would result from a coöperation of the social and medical agencies, and we believe that this is best achieved when the material relief for the patient or the family living at home is directed and in charge of the social agencies specializing in the care of needy families."

Miss Higgins' point of view is supported by a letter from the Consumptives' Hospital Trustees of Boston to the Associated Charities. They said: "It has long been recognized that special training is required before one is competent to give medical advice and treatment, and it is now also admitted that special training is required to enable one to make a social diagnosis and to give material relief wisely; and for this reason it seems to the trustees of the hospital advisable for the applications for milk to be considered with applications for other relief by the relief agencies of the city. The dispensary of the Consumptives' Hospital has accomplished such excellent results in its medical work that the dispensaries of the country will look to it for leadership, and, therefore, it is most important that the division between medical and social work should be adopted by the trustees along lines of sound principles and tried policy."

In New York city the Committee on the Prevention of Tuberculosis, which was and is a special committee of the Charity Organization Society, took over the relief work of that society in families containing tuberculous members in 1903. This was done as an experiment, and the plan was very promptly abandoned when it was demonstrated that it would be best to leave the actual relief problems to the usual agencies of the city.

In Buffalo a very close coöperation exists between the three bodies most intimately concerned in the tuberculosis problem, namely: The District Nurses' Association, the Association for the Relief and Control of Tuber-

culosis, and the Charity Organization Society. The three together maintain a Social Work Committee. This committee meets once a week and outlines a plan of treatment for each family. The Charity Organization Society's workers give the history of the family, the nurse presents her side, and the secretary of the tuberculosis association gives medical information. Then the Charity Organization Society's agent carries out the instructions of the committee and reports back each week.

In Pittsburgh the Tuberculosis League asks the Charity Organization Society to investigate the condition of affairs before it attempts to operate in any family. The league confines itself entirely to the treatment of tuberculosis. It turns the families of infected patients over to the organizations that deal with relief. It gives no material relief itself.

Frank E. Wing, former secretary of the Tuberculosis Institute in Chicago, writes: "My experience has been, and it is my firm belief, that an anti-tuberculosis organization ought first of all to do educational work. If it attempts dispensary and nursing work, as it very properly should attempt, up to the time when such work can be handled by the municipality, it should confine itself strictly to the medical side of the problem, and to such other efforts along educational lines as are made in the care of the tuberculous individual and the control of tubercular infection.

"In the campaign against tuberculosis the visiting nurse becomes one of the most important educative features. While in the nature of things she is most intimately acquainted with the family and must gather a great deal of social and economic information concerning the family, she often is not and cannot be expected to be a trained investigator. If she were a trained investigator, she might not be a good nurse. More than this, it is not her business to assume the whole responsibility for the complete rehabilitation and upbuilding of the family. Her duty is to look after the patient and prevent other members of the family from contracting the disease.

"For above reasons it seems to me that the logical working arrangement for any tuberculosis or dispensary organization where visiting nurses are employed is a complete understanding and division of work in the question of relief. The physician and the nurse should take care of the patient, and in a way the family, and look out for matters of cure and prevention of the disease.

"The responsibility of upbuilding the family and making it independent; of providing it with necessary material relief while the income is cut off; of supplying special diet, etc., to my mind rests with the relief agency. The two must work in very close relation. There should be constant exchange

of opinions and common understandings. But in this period of division of labor it seems to me that it would be expecting too much of the nurse to place the entire responsibility for the care of the family on her shoulders."

In Baltimore we have tried to see to it that each charitable or social agency has its function clearly defined. We have no overlapping in theory, and really very little in practice. We believe that the giving of relief and the provision of trained social service in the homes of the tuberculous poor, save perhaps in the exceptional form of nursing, should not be a function of the tuberculosis association. The Charity Organization Society is, and we believe should remain, the clearing-house of charitable effort of the community. It ought to have oversight of and entry into the home of every needy family in the community. If the tuberculosis association should undertake to provide for the social treatment of these families where tuberculosis is present, even though that disease was the dominating cause of distress, it would naturally necessitate the creation, on the part of the association, of the intricate machinery of the Charity Organization Society. In other words, it would have to duplicate an organization already existing. This would entail a waste of money, a waste of time, and endless confusion in the determination of jurisdiction, and instead of promoting harmony and real coöperation, would constantly be a disrupting element.

This same point of view was taken by Mr. Francis H. McLean in a paper presented before the New York State Conference of Charities and Correction last year, and by Miss Mary E. Richmond, director of the Charity Organization Department of the Russell Sage Foundation.

In the light of this almost unanimous opinion may we not from this time accept it as axiomatic that it is unwise for a tuberculosis league as such to undertake to handle or control problems of material relief of families in which there is tuberculosis, but that policies in dealing with such relief problems in any community ought to be determined in conference between the medical and social agencies, and carried into effect by the trained agents of the social agency.

DISCUSSION ON MR. STEELE'S PAPER

Dr. Theodore B. Sachs, Chicago: The proper solution of each tuberculosis case includes, *first*, a "chance" for the patient—chance of "cure," or improvement, or relief of symptoms, all dependent on the stage of the disease; *second*, an examination of the entire family for the purpose of detecting any additional cases of the disease due to exposure; *third*, a

readjustment of conditions for this family, tending to increase their general resistance. Thus, in a large number of instances each individual case of tuberculosis resolves itself into the problem of a "family group."

The importance of this point is aptly emphasized in Mr. Steele's paper.

The proper solution of an "open" tuberculosis case in a workingman's family means efficient sanatorium or hospital treatment. Isolation of "open" cases is impossible in the majority of cases in such surroundings; if the patient cannot take care of himself, the task falls on another member of the family, thus reducing their total earnings; by keeping such a patient at home we further complicate an already difficult situation. It pays to have sufficient and efficient sanatorium and hospital provisions. Our hospitals for consumptives must be so located, so constructed, and so managed as to attract the patient. With such a provision the necessity of "relief," connected with home treatment, would be done away with in an appreciable number of instances.

As to means necessary to so readjust the surroundings, diet, and other essentials as to increase the resistance of the entire family group and elevate it to the average point of economic efficiency, such means, under the present conditions, have to be supplied by some organization—charity organizations, generally. The time may come when the State will be in possession of sufficient machinery and means to keep the general resistance of all at a high average level.

The formulation and execution of an efficient plan of "relief" disposal ought to be in the hands of a special tuberculosis relief committee, consisting of a physician or a nurse familiar with the medical side of the individual cases, secretary of the tuberculosis association, and a representative of the organization supplying the necessary funds. Such committees are at present in existence in some communities, and ought to be organized in other places.

Tuberculosis is one of the most frequent causes of dependence, and in solving each individual case of dependence due to tuberculosis the charity organization would accomplish better results by leaning on a special committee experienced in the solution of such cases.

THE PAST AND FUTURE OF THE TUBERCULOSIS NURSE

By Edna L. Foley
Chicago

Seven years ago the first visiting tuberculosis nurse was engaged in Baltimore to hunt up "lost patients" and bring them back to the dispensary. Her work was not clearly defined, but she was to carry the gospel of fresh air and sunlight into the homes of the tuberculous poor, whose mortality, in spite of Koch's discovery, was daily raising the question as to the curability of tuberculosis. Education alone not sufficing, she was permitted to feed them, rather generously, a special diet combining the much-needed fats and proteins. Instruction and diet-giving were only part of her work, however, for she investigated their home surroundings, helped them arrange their sleeping quarters to better advantage, got them beds in sanatoria, forced them into hospitals for advanced cases, or got various relief organizations interested in their troubles, proving herself to be a veritable teacher, friend, counselor, or special police, as the case seemed to demand. At the end of a year or two her enthusiasm wavered slightly, and the poor patient was denounced in no uncertain terms as unteachable, ignorant, and careless. The milk which he had sometimes shared with the rest of the family, and the eggs, which had been fried on both sides, or exchanged for food more suited to a protein-wearied palate, were considered wasted, and the last state of the patient was declared worse than the first.

It was something, however, to have discovered that tuberculosis was a difficult subject to reduce to words of one syllable. It was also a good deal to have found that not one patient in five understood the carefully elaborated instructions given him at a clinic, and that the few who did understand were usually too poor to profit by the instruction. And a big discovery was registered when nurses all over the country disclosed the utter inadequacy of institutional care for hopeful and hopeless cases alike, and the fact that tuberculous children seemed to have been left entirely out of architects' or founders' estimates. Open-air schools, day-camps, and even sanatoria have

grown out of the insistent appeal of tuberculosis nurses for places to put their hopeful cases, and their work in the homes has demonstrated the wisdom of this extension of dispensary activity.

From a single nurse in the field in Baltimore seven years ago the ranks of the tuberculosis nurses have increased until we find them at work all over the United States, often in the employ of private anti-tuberculosis organizations, and, more frequently every year, in the employ of the State or municipality. The Health Department of New York city employs 125 of these special nurses. Chicago, Boston, and Cleveland have municipal tuberculosis nurses, and the Pennsylvania Department of Health employs throughout the State 107 who assist at the State tuberculosis dispensaries and visit and nurse the patients in their homes. In spite of mistakes, duplications, and unwarranted pessimism, the tuberculosis visiting nurse has earned her place as a not inconsiderable factor in the fight against tuberculosis; if other proof of this were wanting, the fact that the demand for her far exceeds the supply of her would demonstrate public opinion in this regard. This lack of good nurses in public service is more serious than is generally appreciated. The fact that nurses are not sufficiently socially trained should not trouble us nearly so much as the fact that the best technically trained nurses are being attracted into other fields, institutional or social, leaving the tuberculosis and district nursing staffs in many towns to be made up of applicants whose training-schools were not up to standard and fitted them but inadequately for any field of work. Long hours and unreasonable demands have kept many good nurses out of these fields. Any staff, municipal or otherwise, that allows a nurse opportunity for growth, advancement, and personal initiative gets and keeps good nurses.

The work of the tuberculosis nurse in the dispensaries and homes is so well understood that I need not describe it in detail before a body of experts. Having been asked to present this paper because of my good fortune in serving in tuberculosis work under two municipalities, and one very successful private organization, I am going to confine the remainder of it to what I consider vitally important points in connection with this special branch of nursing. At the risk of disagreeing with many of you I am going to advocate free tuberculosis clinics, in or near the low-rent districts of all our cities, with tuberculosis nurses in attendance; bedside care by the visiting tuberculosis nurse of the tuberculous sick in their homes; special tuberculosis relief given at the request of the physician and nurse, after a conference with a Special Case Committee; a simple, hygienic costume for every nurse; and a compulsory segregation ordinance that will be educational in its enact-

ments and indeterminate in its sentences. It is absurd to expect some of our patients ever to become scientifically discriminating after a few years of scattered instruction, but a few compulsory terms in a sanatorium would teach many of them respect for the law and for the health of others as well.

In regard to clinics, it should not be necessary to emphasize the need of them before this audience; nevertheless, it is true that a tuberculosis nurse is often asked to start visiting work in a town where there is no clinic and little or no provision for the medical care of her patients. To instruct or advise when an authoritative diagnosis is lacking, or when there is no free dispensary or tuberculosis clinic, and poor patients are being treated at long range by busy physicians, or not at all, as the case may be, makes constructive work almost an impossibility. All nurses appreciate and value the good team work of physicians and nurses needed in this campaign, and a nurse who wants her work to succeed and her patients to be benefited considers the clinic the corner-stone of her structure.

To return to my second point, the greatest mistake made by the visiting tuberculosis nurse was not her pessimistic prognostications as to the outcome of tuberculosis work, unaccompanied by a shot-gun or by a drastic segregation law,—every growing mortal has his "Rubaiyat" period,—but her divorcing instructive from bedside nursing. To be sure, when workers were few and the fields large, it seemed better to devote her time to dispensary work and instruction of the hopeful cases, while the regular visiting nurse was sent in to care for the bedridden, hopeless case. This arrangement might have been ideal if all nurses were born teachers, or if the tuberculosis nurses had remained members of the visiting nurses' staff. A good nurse, however, considers that the work of her hands is quite 50 per cent. of her usefulness, and her patients doubtless put a higher valuation on it. Granting either premise, does it seem a logical conclusion of any particular case to turn it over to an unknown member of an entirely strange nursing staff just when the patient's confidence is won, when his need of a friend is greatest, and when his dislike of strangers is most marked?

If an afflicted household ever needs its own particular nurse, it is when the wage-earner or home-maker has lost out in the race and gone to bed, to be cared for by and to spread infection among other members of the family, whose grief frequently blinds them to this danger. To leave such a family to its own devices, or to transfer it at the critical moment, causes unnecessary mental suffering to the sick person who has learned to look forward to the visits of his own nurse, introduces another element into an already demoralized household (for sickness is always demoralizing), and may result in

such strained after-relations that the children do not get examined, nor are their minor complications attended to until latent trouble becomes a positive reality. The nurse was trained in a hospital, not in a normal college, and she should "stick more to her last."

If concrete examples of the above were necessary, all nurses would give plenty of them (for I believe we would all like to give nursing care). Perhaps this one will serve in lieu of many, however:

Olive S., aged ten, possessed tonsils and adenoids that gave her wizened little face a most characteristic expression; her father, in spite of his tuberculous condition, worked every day, had his own physician, and bitterly resented the fact that his wife should have taken his daughter to "a charity clinic." Consequently, he was only politely skeptical when the nurse tried to convince him that Olive's narrow chest and slight physique were handicaps enough, without the added insult of frequent attacks of tonsillitis. For this reason three months' friendly visiting was seemingly fruitless, and may have been actually so, were it not that on the last visit the child, with a temperature of 103° F., was found on the parlor sofa, after a wretched night, with her worn-out mother vainly endeavoring to give her some medicine left by the doctor. It did not take an hour to give the patient a bath, make up a comfortable bed on an otherwise respectable sofa, administer the medicine, spray her throat, and tie her neatly combed hair with Sunday ribbons, and the child went to sleep, to waken refreshed, ready for the cooling drink prepared and left by the nurse as a surprise. An attack of tonsillitis that usually remained a week and upset an entire household was thus aborted by medicine administered at the right time and a single hour's work; while, as a result, the operation was consented to, not because the father's skepticism had decreased, but because his respect for the nurse's opinion had increased. Following this child's uneventful recovery, a younger sister and three other pretuberculous children in the same block willingly lost their tonsils a few weeks later. In this case the instruction might have borne later results, but surely the personal service—one mustard foot-bath against three months of friendly visiting—speaks volumes for combining nursing care with instruction. Our patients are too much like "the man from Missouri"—speech alone does not impress them nor always educate them.

Then, too, it is almost inhuman to suggest that a nurse whose hands fairly ache to do the few little things that would make her patient so comfortable should confine herself to oral instruction, when it would be so easy to give both at the same time were she suitably dressed for her work and had she a small nursing kit in her bag. As long as the average public institution

for the care of the advanced consumptive retains its present character, there will be many patients of this class in need of home supervision, and it is a waste of effort to instruct the incipient cases in these households if we overlook the source of the infection and neglect the advanced cases, by withholding care that would increase their comfort and incidentally their willingness to obey instructions.

Now, as regards the giving of special tuberculosis, not family, relief: the nurse is not, nor should she be considered by her patients, a relief-giver. This does not mean that she should never give anything, for sick-bed diet is as essential as medicine or air, and should be given when ordered or needed. Tuberculosis relief, especially in families above the poverty line, where illness causes the need, should be given liberally if we are going to check, not merely prolong, the disease. The Special Case Committee will help meet these demands, for two reasons: First, because its interest is primarily in the tuberculosis aspect of the family problem; and, secondly, because it will be able to handle each case promptly, and possibly, by its action and recommendation, succeed in keeping down the number of investigators going into the family. The Tuberculosis League of Cleveland has worked this committee plan out splendidly. Regular weekly meetings are held. The directing physicians of the Tuberculosis Dispensary and of the Babies' Dispensary and Hospital, a representative from the Associated Charities, one from the Visiting Nurse Association, and the City Health Officer are among the membership, which also includes several laymen possessing sympathies or influence which would be of value to the committee, and having, in common with the others, experience and sound judgment. A special nurse, whose salary is paid by the Committee, presents the cases, and no case is considered closed unless a final disposition is made.

If relief which cannot be given by the Associated Charities is needed, the committee raises it; if the need be volunteer visiting for counsel, encouragement, or friendship, one of the members is detailed to do it; if sanitary regulations are being openly defied, another member spends the time to go more closely into the matter; if children need dispensary care and the mother is too busy to take them, this is also arranged for by the committee. In fact, a thousand and one little details, which are really very important, but are frequently left undone or bungled, because time to work them out intelligently or patiently is lacking, are assumed by this committee. Then, when the special tuberculosis problem is worked out, the special nurse hands the case back to the visiting tuberculosis nurse who had it originally. Only those cases where the solution of the problem would mean robbing the other

patients of their rightful time are given to the special case nurse. In this way immediate help of various kinds is gained for worthy families, and sometimes representatives from half a dozen different organizations are kept away, or, if they must go, they visit as friends of the nurse. This Special Case Committee is not intended to replace the relief organization, nor to relieve it of all responsibility in regard to families where tuberculosis is the primary cause of the poverty. Its relief is rather intended to supplement the relief work of such an organization only in those cases where the society's previous rulings prevent its giving the needed assistance. But the giving of relief is, in reality, a very small part of this committee's work, and its gifts are not made without due regard for the opinion of the charity organization worker in its membership. The central registration bureau of the Associated Charities is always consulted, in order to avoid needless investigation. One of the difficulties of modern philanthropy is this duplication of visits, until it seems to many of us as if the upbuilding of character by frequent investigation must include the destruction of a decent personal pride and self-respect.

The social worker who cites endless tales of the tuberculosis nurse's ill-directed almsgiving is met on every turn by the nurse who can tell equally bad tales of the social worker's disastrous relief-withholding, whereas the patients each desires to serve may be more simply and adequately reached by referring them to a court of special appeals, which is sufficiently nicely adjusted to weigh the social, medical, legal, and economic aspects of the case before deciding on its merits. For individual decisions are human, and, therefore, liable to error, and sometimes the mind of one type of an organization is human also, and it is conceivable that even a relief organization might err occasionally, but a committee composed of many minds from many interests can be to its patients a "city of refuge" as well as a final tribunal. In Cleveland this special committee was formed by the Tuberculosis League, but there is no particular reason why it should not be an adjunct of the local relief organization. To be really effective, such a committee must be composed of people very much in earnest, and should be so strong in its membership that the implied coöperation would be limitless in its power for good.

A nurse is trained to see the physical needs of her patients and to act quickly; she knows, too, that anxiety and avoidable worry are frequently as disastrous as the primary infection, and to her the payment of back rent is not a mortal sin, nor is food for anemic children a crime against the sanctity of the home. A day-nursery for children while the deserted mother of

six or eight works by the day does not strike her as logical if those children are ever going to amount to anything, although a pension to that mother may be encouraging a worthless father in his idleness. Discipline for the father of these children quite meets with her approval, while to let the innocent suffer with the guilty may be justice, but seems bad economics. Refusal to aid the large family where there are three cases of tuberculosis because their cottage with its yard and porch rents for $15 and they refuse to move into a $10 rent, without regard to room-space, seems to her absolutely criminal, whereas her insistence that the family is in every way worthy of aid may seem blind and unreasonable to the relief organization. To cite special cases wastes time, and occasionally causes ill will. The nurse understands perfectly that the solution of the tuberculosis problem is inextricably interwoven with the big problems of housing reform, standards of living, minimum wage, and the eight-hour day, but she is placed in her district to act now, not in the millennium, and her patients are to her sick people, her ministry to serve them, not to classify them à la Turban or Darwin. A Special Case Committee, with time to consider her families, would be of inestimable service to a busy nurse.

The responsibility of giving relief should not rest upon the individual nurse, but the power to relieve must be nearer than it is now, and to her technical training should be added a social training which must be given her in both field and class-room, until she learns to discriminate in her service as well as in her sympathies. Academic theorizing is of little assistance to the woman whose daily work takes her in and out of homes where physical suffering, no matter whose sin caused it, is present, and she needs a well-balanced mind to keep her from becoming so depressed by the scenes in which she works that she is unable to retain her enthusiasm and her "open mind." Nurses engaged by private societies have, perhaps, more opportunity of keeping a future vision ever before them, but, on the other hand, the problem is too tremendous to remain in private hands long, and the municipality that shirks its responsibility or engages indifferently trained women to do its tuberculosis nursing will lose out in the long run, for its tuberculosis situation will remain unchanged if its people are ill taught. In some places a certain stigma attaches itself to women in public service, and this can be dispelled only when people realize that the field needs intelligence as well as training, and to get and keep both qualities in its service a city must grant its workers unrestricted opportunities for growth and advancement.

A uniform for the tuberculosis nurse is a much-mooted question. Personally, I believe that there should be a standard, if not uniform, costume—

simple hat, washable dress, and plain, long coat, purchased after consultation with the supervisor. In small towns, or until tuberculosis becomes less of a bugbear than it is now, a striking uniform serves only to make landlords uneasy and patients more so. On the other hand, to those of us accustomed and fond of the trig neatness of a nurse's uniform, a roomful of nurses, on duty, in all kinds of raiment, is as distressing as an orphanage of children all dressed in brown gingham is to a real lover of little people. In large cities where there are many public nurses a compromise might be effected by having a common uniform for all nurses, selected by a committee composed of their superintendents. No uniform should make the wearer needlessly conspicuous, but a not-striking uniform plus a decent hat would be willingly worn by any nurse who felt that she thus identified herself with others in a good work. A nurse's uniform should mean to her what a soldier's does to him,—a constant reminder of the cause she serves,—and, though she need not wear it to grand opera, she should wear it on duty. A neat, easily laundered dress sets a good example in her district, and is a decided protection to the woman whose work takes her into all sorts of contagion.

Lastly, I would plead for segregation of open cases of tuberculosis. Voluntary segregation is, of course, more ideal, and will interfere not at all with a democratic belief in personal liberty. This, in a large number of cases, would be possible were the institutions provided, properly built, equipped, and managed. Buildings and equipment cannot be expected to do everything; the spirit of the place is a direct index of its management. If a diet suited to day-laborers is provided for patients whose digestive powers are seriously impaired by disease, or if medical attention and nursing service are negligible quantities, no patient is going to be sufficiently altruistic to die in discomfort when home, no matter how poor, means an attempt, at least, at better food and care. Nor would the public at large, nor the special workers, wish to consign a patient to perpetual sentence in such an institution simply because his disease, not his crime, made him an unwelcome member of society. People who are going to die, whether in two months or two years, need to be helped to forget that the sentence of death is hanging over them. It is not necessary to have our hospitals for advanced cases so badly managed that patients refuse to remain in them. The Boston Consumptives' Hospital is intended for moderately advanced and advanced cases, and it has become such a comparatively simple matter to send patients there and to keep them there that the nursing care given in the homes by the Boston visiting tuberculosis nurses is done more in cases of emergency than as part of the regular routine.

A recent visitor at the Maryland State Sanatorium, where hopeful cases and others are treated, remarked that he felt as if he were leaving a rest resort rather than a hospital. If Boston and Maryland can obtain voluntary segregation in a large number of cases, the plan is not Utopian. On the other hand, there are a *few* patients whose warped mentalities make them take an almost malicious delight in exposing their families to infection. Such patients should be restrained from spreading the disease further, and as long as a patient remains unwilling to take the simple precautions necessary, he should be made to feel that his refusal to do so is a misdemeanor, and should be punished accordingly.

Many of our patients, whether from above or below the poverty line, are strangely ignorant of the laws of hygiene, and the unseen presence and rapid reproduction of the tubercle bacilli are to them inconceivable. They cannot be ordered—they must be taught. It is not good sense to ask that these poor souls comprehend in a few brief instructions facts that opened a new world to us, or to ask them, for reasons they cannot possibly understand, to change habits of a lifetime—nay, of generations—without taking into consideration their racial characteristics and superstitions, their religious beliefs, or their inherited tendencies. We have asked the German to exchange his beer for milk, the Italian to open his window at night, the Irishman to give up his "wakes" and tobacco, the Hebrew to make radical changes in his diet, and the American citizen of every descent to refrain from nickel shows, crowded meeting-places, and dance-halls, which to him make life worth living. We have taught a crude eugenics to mothers absolutely unable to carry out our instructions. We have sometimes foolishly taken work from a patient and then offered him a stone. We have asked patients to sacrifice time, tradition, and family ties even for that will-o'-the-wisp, health. For some we have gained this; others have fallen by the wayside, or given up the struggle in disgust and despair, and the mass of the people, because of circumstances over which they have no control, are as yet unimpressed. The nurse's educational attempts must extend beyond her present horizon. By patient endeavor, coöperation, and ceaseless example she must teach and nurse the patients who look to her for relief. By a close coöperation with all the agencies in the city she can, by her observations, aid the workers whose field lies in relief giving, housing reform, and what not. She must win from the public, by an intelligent discrimination, sympathy for the many deserving, or compulsory segregation for the comparatively few wilfully careless, patients. Her work with the physicians at the clinics must enable her to carry their instructions to the patients, to

bring back the social diagnosis that will best assist in their treatment of each particular case. By her work with the children of the tuberculous she must help school boards to realize how easy it is to teach hygiene to children before they grow into skeptical and slow-reasoning adults; and, finally, by her service to her people and all these other agencies she will create in the work a new spirit, and in herself a new personality, for, after all, a chain is only as strong as its weakest link, and on the nurse, as the go-between for public and patients alike, rests a tremendous responsibility.

She must have time for all these things, for she is the logical go-between, and sees the crying need of them. Until we educate public opinion we cannot enforce distasteful compulsory segregation ordinances, and the patients, their people, their friends, and employers, form a large part of public opinion. Is it necessary to add, in closing, that the nurses for this great task must be well trained, well chosen, and highly efficient?

DISCUSSION ON MISS FOLEY'S PAPER

Dr. Theodore B. Sachs, Chicago: The paper of Miss Foley is timely. I am glad to have this opportunity to say a few words for the visiting tuberculosis nurse. The quality of her work depends upon her fitness and adequate training for the task, efficiency of the directing organization with which she is connected, enthusiasm for tuberculosis work, a certain degree of ingenuity in meeting the variety of problems furnished by individual cases, knowledge of all coöperative agencies and ability to utilize them, and, not least of all, her good physical condition. This last point is frequently overlooked. I have worked with nurses during the last fifteen years, and have wondered at times how they can maintain themselves adequately at some of the existing wages.

In order to develop an efficient force of visiting tuberculosis nurses certain important conditions must be fulfilled:

1. *Preliminary Education and Good Hospital Training.*—We need tuberculosis nurses of substantial general education, good hospital training, and specially adapted for the work. To get such nurses into the tuberculosis field the present average compensation of nurses must be raised to a higher level.

Good general education furnishes the broad view—the proper insight in life. Good hospital training must antedate the study of tuberculosis as a special disease—a study so essential to the increasing efficiency of the tuberculosis nurse. It is absolutely essential that hospital training-schools

should devote some time in their curriculum to the teaching of the causes, prevention, and treatment of tuberculosis. It would be of great benefit to the community if a large percentage of nurses would be given one month or more of postgraduate or undergraduate training in tuberculosis sanatoria, hospitals, and dispensaries.

The tuberculosis nurse must possess good general and medical education and training before entering the field; she must also possess the enthusiasm for further study and increasing efficiency.

2. *The Compensation of the Nurse.*—At the present average salary of seventy dollars or less a month a nurse living away from home can hardly maintain herself in proper physical condition. During the last ten years we witnessed the increased cost of necessities of life; the nurse's wages, however, remain the same. It is very essential for the nurse to be in good physical condition. In tuberculosis work her life is devoted to the care of the sick and the raising of the resistance of others. Her own resistance ought to be at high level. After spending about twelve to fifteen dollars a month for her lunches, she has just enough left to make ends meet.

The compensation ought to be sufficient to furnish her with a good room in a healthy locality, good wholesome food, good clothes, and yet leave a margin for recreation and some savings at the end of a month's hard work.

Nurses age prematurely more often than any other class of people, as the result of hard work, inadequate diet, and insufficient rest.

One hundred dollars a month would be a more or less adequate compensation for a nurse after one year's probation. Her tenure of office ought to be also certain, dependent upon the efficiency of her work.

3. *The Gradual Development of an Efficient Visiting Tuberculosis Nursing Force in a City.*—Through the operation of the civil-service law as applied to nurses a strict examination, eliminating those without adequate education and training, a continuously improving system of supervision and direction, a course of lectures and conferences on the various medical and social phases of the disease, and continuous stimulation of enthusiasm, the dispensary department of the Chicago Municipal Sanitarium is gradually developing a cohesive, efficient nursing force—about thirty in number at present. We, the directors of the Chicago Municipal Sanitarium, are proud of their work, and stand ready to do everything in our power to so develop their efficiency as to make this an exemplary tuberculosis nursing force in America. We hope to accomplish this with the present high class of nurses on our staff and Miss Foley as their superintendent.

TUBERCULOSIS AS A FACTOR IN THE INCREASED COST OF LIVING

By Edw. F. McSweeney
Boston

In a paper read at Washington in 1908 by Professor Irving Fisher to the International Congress on Tuberculosis, the costs of tuberculosis were formulated and expressed in definite figures. The totals in actual money cost, excluding the penalty in misery and unhappiness, were so amazingly large that they seemed to go over the heads of the people, who are so fixed in their belief that inasmuch as this disease has been wrecking homes for centuries, it is to be regarded as a visitation from God, and not to be resisted, although science proves it can be prevented and religion teaches it must be fought. We have become accustomed to it as the peasants living on the slopes of Mount Vesuvius no longer fear the outbreak of the volcano until the deadly molten lava appears at their doors. The idea that it will pay in money to conquer tuberculosis is seemingly only beginning to penetrate the national intelligence. Of $163,000,000 in public benefactions last year, $19,100,000 were for health purposes, but not one dollar of this was for teaching national, State or municipal officers how to get the benefit of the knowledge Pasteur and his disciples gave us. We know all about tuberculosis, but merely saving people from dying does not seem to appeal for further help. The sum of $6,800,000 was given to finding out about hookworm, cancer, etc.,—worthy work,—but after we find out what these diseases are, will we continue to let the world suffer as before for failure to apply the known remedy, and keep forever chasing the elusive microbe to his lair? As it looks now, it is the joy of the chase, and not the capture of the game, that attracts us.

Rockefeller and Carnegie have given away $35,000,000 for libraries, books, colleges, part of which has been for medical research, but not one dollar specifically to further the administrative use of knowledge already possessed.* Last year the hospitals and medical colleges got $12,200,000,

* Wm. H. Allen, Ph.D.: Annals of the American Academy, March, 1911.

but the Committee of One Hundred on National Health could not raise $10,000 to fight the patent medicine trust, quacks, and faith-cure frauds who have been able to defeat in Congress the proposed act to create a National Bureau of Health.

In 1909 Mayor Hibbard, of Boston, was requested to deliver an address in the South, and asked me to prepare for him some figures as to the cost of consumption in Boston, which I did, using Professor Fisher's tables. Wishing to be safely conservative, however, I reduced them one-half. Mr. Hibbard told me afterward that he was greatly disappointed at the open credulity which met his assertions as to the cost and danger from this disease. His own sad death from tuberculosis only two years later proved that his interest in this curse, so soon to claim him as a victim and cut short a useful life, was prophetic.

The course of recent events has forced public attention to a consideration of the question of how much the wastes of society are reflected back in the shape of an increased cost of living. Since 1897 commodity prices have been advancing steadily all over the world, and an attempt to find the cause or causes of this phenomenon has been made by the governments of practically all the civilized nations.

The result of this general inquiry has been to agree that the initial impulse in the increase in the cost of living during the last fourteen years has been the increased cheapness of gold. Let me state some economic axioms: *Gold* is the standard of money; *money* is the measure of value and the medium of exchange; *price* is the ratio at which *commodities* will exchange for money. A general rise in prices means an increase in the quantity of money and a decrease in its purchasing value, for value in either money or commodity increases with scarcity and decreases with abundance. While this condition explains the upward tendency in the cost of commodities, it accounts, however, for only about one-sixth of the maximum increase.

The opinion that the tariff law, the trusts, and the illegal activities of monopolies have been wholly responsible for high prices is not justified. These elements are constant factors in the upward movement, since they are artificial barriers to the working of the natural laws of economics, but they have been operating as actively in periods of falling as in periods of rising prices. The principal burden of the recent advance in the cost of living must be sought elsewhere, and the investigators have found that the most potent element in the evil is waste, which is an unnecessary and preventable loss of the elements and materials of life and living. Under waste we group extravagance in public and private expenditure; the outlay for the

non-productive activities of war and its preparation; the cost of the burden of crime, pauperism, insanity, accident, and disease, and the losses to agriculture and industry due to ignorance and inefficiency.

In the consideration of this subject for our purposes the waste due to unnecessary and preventable disease and death takes first place; and in this waste, tuberculosis is the principal factor. While the victims of preventable disease are of all ages, consumption occurs largely during the most productive period of life. It is a factor in the increase in the cost of living, because it takes its toll from the ranks of industrial efficiency, who not only cease to produce and continue to consume, but are turned into burdens to be piled on efficiency. The "silent slayer," the "white plague," is at work day and night, insidiously gathering in its victims, weakening industry, and making its evil influence felt in every human effort.

The number of persons afflicted with tuberculosis in the United States is not less than 919,722.

The yearly money cost of tuberculosis alone in the United States, at the most conservative minimum estimate, is $622,513,904.70.

On the present ratio of deaths annually from consumption, as compared with the deaths from all causes, 10,000,000 persons now living will eventually die of this disease.

If, as science asserts, we could save 50 per cent. of these lives, it would mean adding to productive industry a population about equal to the entire population of all the New England States.

Senator Aldrich's statement that waste and inefficiency were costing the government $300,000,000 a year made the nation sit up and take notice, and led to administrative reforms that save millions annually; yet if Mr. Aldrich's figures are absolutely correct, they would still be less than half the annual cost in loss of wages and expenses incidental to the maintenance and care of persons who die of tuberculosis in this Republic every year.

The annual toll paid to tuberculosis would pay the entire cost of building the Panama Canal, and still leave $200,000,000 for such purposes as education, irrigation, etc.*

Consumption constantly takes more persons out of productive industry than there are wage-earners in the State of Massachusetts.†

The combined wages paid in Massachusetts in 1905 would pay less than half of the loss due to this disease in the United States every year.‡

* Estimated cost of Panama Canal, $375,000,000.

† Number of wage-earners in Massachusetts, 1909, 584,559.

‡ Total wages in Massachusetts, 1905, $232,388,946.

The average family income of the country is less than $800, but accepting this as the maximum average, the toll of tuberculosis exceeds the total income of 778,142 families.

These losses are from tuberculosis alone. When we consider the loss from all preventable diseases, the figures stagger comprehension.

According to the report of the Committee of One Hundred on National Health, there are always 3,000,000 persons in the United States on the sick list, about 1,000,000 of whom are in the working period of life. Figuring the waste from preventable disease, from all causes, the loss of wages or income, the expense of medicine, medical attention, special foods, etc., the annual cost to the United States is $1,500,000,000 at the very lowest estimate. Professor Fisher says that the actual figure may well amount to several times this amount, but when statistics are based partially on conjecture, they need to be stated with special caution.*

The Massachusetts Commission on the Cost of Living, of which I was a member, made a special inquiry into the extent of waste from disease and death in Massachusetts, and found the loss to Massachusetts in 1908, of preventable death and serious illness, to be $52,137,112.50.† This makes an average per capita cost of $15. Estimated on the basis of five persons to a family, this means an actual annual family cost from preventable death and illness in Massachusetts of $75, or almost one-tenth of the average family income. This figure verifies the estimate of the national annual loss from preventable disease of the Committee of One Hundred on National Health of $1,500,000,000.

These figures, it should be remembered, do not consider the loss to the nation of the economic value of an industrial unit, capitalized on the basis of potential earning power, or the money invested in individual upbringing, training, and education.

The Civil War lasted less than five years, with a recorded loss of 490,000 lives and a money loss of $5,000,000,000. Fifty years after the Civil War, and three decades after the announcement of the discovery by Koch of the tubercle bacillus, and the announcement by Pasteur that tuberculosis is a

* Report on National Vitality, page 12.

† 21,906 postponable deaths, costing $1700 each, ... $37,240,200.00
25,893 persons seriously ill during the year, 50 per cent. of whose illness could have been prevented, earning $525 each during the year when well, ... 6,796,912.50
$16,200,000 cost of illness, 50 per cent. of which is preventable, ... 8,100,000.00

Total, ... $52,137,112.50

From page 617, Report Massachusetts Commission on the Cost of Living, 1910.

preventable disease, the death loss from tuberculosis in the United States for every five-year period is almost twice the total mortality on both sides of the Civil War.* A minimum estimate of the loss from all preventable diseases in the United States, including tuberculosis, every five years, is greater than the money cost of the Civil War.†

One year's loss from preventable disease, including tuberculosis, in the United States, would pay the national debt.‡

It would pay the annual interest on the national debt of the entire world.§

It would reimburse England and the Transvaal for the Boer War.||

It would repay the cost to the United States of the Spanish-American war.¶

It is equal to the capitalization of the United States Steel Company.**

It would provide for the capitalization of all the national banks in this nation, and leave enough money over to build the Panama Canal.††

NUMBER OF PERSONS AFFLICTED WITH TUBERCULOSIS IN THE UNITED STATES

The estimate of Dr. Phillip, of Edinburgh, that for every death from tuberculosis there are 10 cases of the disease, has been accepted generally as a rule of thumb basis for computing the number of persons suffering from it.

Five years ago Mayor Fitzgerald organized tuberculosis work in Boston. He was the first chief executive of any American city with foresight sufficient to anticipate what is now accepted as the proper and only basis of municipal action, *i. e.*, care of the advanced case. There were then 2500 persons on the Board of Health records reported by physicians as suffering from tuberculosis. On the first day of June, this year, the Boston Board of Health have on file, as a result of our tuberculosis work, 7000 living cases of tuberculosis reported by the physicians.‡‡ That all the tuberculosis cases in Boston are reported today nobody believes, but, accepting these records as complete, this means that more than 1 per cent. of the population of Boston

* Mortality in Civil War, 494,400. † Cost of Civil War, $5,000,000,000.

‡ National debt of United States, November 1, 1909, $1,295,147,432.04.

§ Indebtedness of nations, exclusive of United States, computed up to the year 1906, $26,517,504,541. Annual interest paid thereon, $1,134,296,179.

|| Cost of war Transvaal Republic and England, $1,100,100,000.

¶ Cost of war United States and Spain, $1,165,000,000.

** Capitalization United States Steel Company, $1,500,000,000.

†† Capitalization National Banks in United States, 1910, $963,457,549.

‡‡ Statement of Boston Board of Health.

are actually recorded as afflicted with tuberculosis. A State commission, appointed in 1909 to study the question of tuberculosis in Massachusetts, set the number of persons afflicted with this disease as 35,000. This also works out a little more than 1 per cent. of the population, which is just about one-half of Dr. Phillip's estimate of 10 cases for every death. This estimate of 1 per cent. would make an average of 919,722 persons in the United States afflicted with tuberculosis. Dr. Osler estimates one million and a quarter of cases in the United States all the time, so if the 1 per cent. estimate errs, it is on the side of caution.*

ANNUAL ACTUAL FAMILY COST OF TUBERCULOSIS

Since September, 1907, when the Boston Consumptives' Hospital established its Out-patient Department, to June 1, 1911, we have had 9348 voluntary applicants for examination, of which 3106 have been found to have positive tuberculosis. From the records of these positive cases Dr. Locke has made a careful inquiry of the actual cost of tuberculosis, which will be submitted by him to this congress, so I will confine myself merely to general conclusions derived from his work.

From the records of 400 cases given me by Dr. Locke I find that each case represents a family of 4.7. This figure, applied to the whole nation, indicates more than 4,000,000 persons either having the disease or in daily contact with it, and we know that it is constantly living with, and not casual proximity to, the consumptive, on the street or in theater, hall, or elsewhere, that spreads the disease. The sick member of the family requires waiting on, and this reduces the amount of family income. The decline in the weekly family income, including the consumptive, indicates an annual loss for all these 400 families of $192,026, or an average loss each of family income of $480.06.

Dr. Price gives as the period of total or partial disability at three years and one month.† Professor Fisher says that it is probable that death is usually preceded by a period of from three to five years, during which little or no work is done.‡ Accepting three years as the period of total disability, which will be verified by another table of Dr. Locke's, we find the total average loss of family income for these 400 cases is $1440.20.

Estimates of the cost of medical attention, food, nursing, etc., vary greatly. Dr. Biggs, of New York, puts it at $800 for the period of total

* Report on National Vitality. † Jour. Amer. Med. Assoc., April, 1905.
‡ "The Cost of Tuberculosis and its Reduction," page 14.

disability, without making allowance for the period of partial disability. This also seems to be too conservative, being only about $5 a week for board, clothes, amusement, medicines, and medical attendance; but it is safer in these matters to err on the side of prudence. Estimating the total actual cost of each death of a producer, based on this estimate of $800 for three years' food, medicine, care, nursing, and burial, with three years' loss of family income at $1440.20, we find the total actual loss for each patient of $2240.20. Another table prepared by Dr. Locke verifies these figures, and indicates that the estimate of three years as the period of total disability is conservative. Of 500 cases registered in our Out-patient Department from its opening, September, 1907, to June 1, 1910, 276 had died and the remaining 224 were living May 1, 1911. The total loss in wages of the 276 dead was $174,105, and of the 224 living up to May 1, 1911, $243,831. The 276 who died show an average wage loss of $630 each. Inasmuch as in the beginning of our work many of the patients were far advanced in the disease, this $630 average loss of wages of those who died is of little value for estimating the actual wage loss. The 224 living on May 1st, however, already show an average wage loss of $1088 each, and it is certain before they die will exceed the average of $1440.20 of family income, based on the estimate of three years' disability.

NUMBER OF DEATHS ANNUALLY IN THE UNITED STATES

The total deaths from tuberculosis in Massachusetts for 1909 were 5998,* and the percentage 18 per 10,000 of population. These figures approximate the latest figures of Germany (18.5), Norway (19.6), and Switzerland (18.8),† where statistical work is done more systematically and with definite, ulterior, scientific aims.

Massachusetts is an industrial, manufacturing, and agricultural State, with conditions making for good health as favorable as in any of the State in the national registration area. The tuberculosis mortality in some of the States most favored by climate is the highest of any. In the Southern States the negro mortality from tuberculosis is admittedly excessive, so we may assume that the recorded statistics of deaths from tuberculosis in the State of Massachusetts, 18 per 10,000, may fairly be applied to the population of

* Report of Massachusetts Commission to Investigate Tuberculosis, November 1, 1910.

† Figures as to mortality statistics in Germany, Norway, and Switzerland by National Association for the Prevention and Control of Tuberculosis.

the entire country, which would make the tuberculosis rate for 1909 for the whole nation, based on the 1910 census, as 165,549 deaths.*

TOTAL COST OF TUBERCULOSIS ANNUALLY IN THE UNITED STATES

The United States Census shows that 90 per cent. of men and over 20 per cent. of women over sixteen years of age are engaged in gainful occupations. This does not include as engaged in gainful occupations women who do housework. Although not earning money, their death is an economic loss to the family; when the housewife dies, a housekeeper must be employed or the family must board out. It is fair, therefore, to regard the death of an actual housewife as a money loss; and taking this into consideration, two-thirds of all women of working age are actually at work. This ratio, taken in connection with the corresponding ratio of men, shows that over three-fourths of all persons of both sexes are either actually earning money or saving expenses by housekeeping.†

By Dr. Locke's figures, the minimum individual cost of sickness, loss of family earnings, and death is $2240.20. Assuming that three-fourths of the 165,549 consumptives who die annually (124,161) are producers, their deaths represent an actual loss of $278,147,152.35. Computing the cost of the other and non-productive fourth (41,387) only at Dr. Biggs' estimate of $800 for three years' medical care and attention during total disability, we have a sum of $33,109,800, which brings up the total annual money loss from this year's deaths to $311,256,952.35.

In addition to the 165,549 who die of tuberculosis this year, an equal number have passed through two years of their total disability, cost of medicine, etc., and will die next year, and a similar number will die two years hence, who have undergone one year of their final period. This omits from the calculation about one-half of all the persons in the United States who have the disease in some stage, which the moment it enters the human system reduces the productive efficiency of its victim, although he may continue to work for many years before a positive diagnosis is made. By adding

* The National Conservation Commission in its Report on National Vitality estimated the annual mortality from tuberculosis in the United States at 200,000, regarding which the United States Census Bureau says: "This statement (the loss of 200,000 lives a year from tuberculosis) is a reasonable one, and probably well within the limits of precision attaching to any estimate" (page 19), "Tuberculosis in the United States," Department of Commerce and Labor.

† Professor Irving Fisher on the "Cost of Tuberculosis in the United States."

the percentage of cost to date of those who will die next year and the year following, we have an amount equal to the cost of those who die this year, and makes a minimum annual drain on the people of the United States from tuberculosis alone of $622,513,904. This estimate of $622,513,904 as the annual cost of tuberculosis, which will almost pay for all the coal mined in the United States this year,* assumes that of all the consumptives in the United States at the beginning of the year 1911, only those who will die before January 1, 1914, are operating to affect the cost of living by reducing production and increasing demand.

Preventable disease, the greatest item in which is tuberculosis, and the other expenses which grow out of it, cost each family in the United States at the minimum $100 a year. In other words, the American wage-earner and producer works one day in every six to pay for the cost of disease and its consequences. Who can dispute, in the face of this overwhelming proof, that preventable disease and death not only make for misery and unhappiness, but have a direct influence on the cost of living.

THE COST IN THE FUTURE

Ten million persons now living in the United States will die of tuberculosis unless prevented by the adoption of wise laws, strictly enforced. One half of this number, more than the total negro population of the United States before the Civil War, can be saved. If each of these 10,000,000 possible deaths cost only the $2240.20, the actual loss in wages, the cost of sickness and burial, the final cost to the nation for those now living who will die of tuberculosis will be $22,402,000,000, a sum approximating four-fifths of the combined debts of all the nations of the world.

Despite our vaunted civilization, our general prosperity, our extravagant charity and rapid progress in the arts and sciences, we are still living in the middle ages, so far as the prevention of disease is concerned. In all the cities of the United States the sanitary conditions among the poor are so bad, and the failure to enforce health laws so flagrant,† that even were we to increase our sanatorium facilities for consumptives tenfold we would still make little impression on the disease.

Why should England have a tuberculosis death-rate of 12.1 per 10,000,

* Total bituminous coal, 1907, 388,222,868 tons. Value at mines, ... $463,654,776
Total anthracite coal, 1907, 86,341,832 tons. Value at mines, ... 198,653,218

Total value, ... $662,307,994

† "Housing and Health," Lawrence Veiller.

as compared with the 18 of Massachusetts? The death-rate of England and Wales, if these figures are true as reported, applied to the whole United States, would show a saving of 54,263 deaths in this country every year.*

The decrease in the deaths from tuberculosis during the last twenty-five years is not due to any organized fight against it, but rather to the advance in hygienic knowledge and the methods of street railway transportation, which enable city workers to live in the open. The inventor who gave the world the electric street railway and the five-cent fare, and the capital that made his ideas effective, saved millions of lives in the last two decades, and are entitled to a large part of the credit for the decrease in the tuberculosis death-rate. At the present time the best evidence is that while the death-rate from all causes is tending to decrease, that from tuberculosis is declining very little, if at all.†

The scandalous inadequacy of the official vital statistics of the United States is realized fully only when one attemps to ascertain conditions of life and health in the country and their relation to other interests. In only about half the States and territories is any attempt made to collect and compile vital statistics; in many of them such things as life and death, marriage,

* Figure of 12.1 for England and Wales furnished by National Association for the Prevention and Study of Tuberculosis.

† Bulletin Mortality in the United States Census, 1910. Special report, W. F. Wilcox, Thirteenth Report New York State Board of Health:

"*Our Absurd Vital Statistics.*—Vital Statistics in this country are an infant science. Yet they are the very basis and foundation of any attempt to better the general health. Knowledge of what is killing us before our time is the first step toward saving our lives. The Census Bureau does its best to acquire this essential information."—Samuel Hopkins Adams in McClure's, July, 1908.

"*Resolved*, That the achievement of the registration of all deaths, with their causes, immediately after their occurrence, and the prompt return of certificates from local registrars to the Central Bureau of Vital Statistics, thereby giving the sanitary authorities of the State timely information of the exact prevalence and distribution of disease, is the most important of all sanitary measures, and should be unremittingly urged until successfully carried out in every State of the union."—Associated Health Authorities and Sanitarians of Pennsylvania, 1904.

"Public hygiene is built upon, is controlled and directed by, and is everlastingly in debt to, vital statistics. The might and the right to direct future of preventive medicine, to make and to terminate contracts, to approve and reject risks, to test materials and methods, to invest means and to distribute profits, these things belong inalienably to vital statistics. Every wheel that turns in the service of public health must be belted to this shaft, otherwise preventive medicine must remain invertebrate and unable to realize the profits available from the magnificent offering of collateral sciences. If the unborn historian of hygiene in the twentieth century shall find one anomaly more curious than the other, it will be that the twentieth century, opening with prodigious resources, immediately available, ran a third or half its course before these resources became so standardized that each unit of power might be accounted for in a definite scheme of vital statistics."—Dr. John S. Fulton, "Vital Statistics: A Plea for Actuarial Administration and Control of the Great Resources of Preventive Medicine," read before the American Public Health Association, 1902.

and birth are officially of less importance than the bounties on vermin. Accurate vital statistics are the foundation of sanitary science, and absolutely necessary for the prevention of tuberculosis. (See p. 140, foot-note.)

In the introduction to this year's Tuberculosis Directory Dr. Farrand says that "it is obviously too early to expect a definite drop in the mortality curve as a result of the specific campaign against tuberculosis in the United States." "There are," he says, "in certain quarters, indications which offer distinct encouragement, and perhaps it is within the limits of conservative judgment to look for a specific result within the next five years, and for a reduction of marked dimensions within a decade."

I am an optimist, but I wish I could be as optimistic as Dr. Farrand. The first result of an active tuberculosis crusade ought to be largely to increase the recorded mortality from the disease, because it would force physicians honestly to report their cases, which they are not now doing. Not the decrease in deaths, but the decrease in infections, should be the measure of success in our campaign. While we may be lengthening the lives of those already afflicted, we are also giving them a longer time to spread the disease, and when they eventually die, we have not the compensation of knowing that the number of recruits to the ranks of the white plague to take their place has decreased. With the exception of Boston and New York, I know of no municipalities that have planned scientifically to care for the advanced cases—the real spreaders of the disease. For the last three years every scientist and physician competent to speak has agreed that the first need was for hospitals for advanced cases; yet sanatoria for incipient and not for the advanced cases are going up everywhere, to monopolize the money contributed to the cause.

Tuberculosis is a disease of the poor. The rich who contract it may, by moving to a salubrious climate, or by careful living in their former environment, eventually die of some other disease. No matter how much we patch up the poor in the incipient stage in the sanatorium however, when we turn them back into the surroundings which originally produced the disease, as a rule, they relapse and die. Statistics of so-called "cures" are practically worthless. In our work in Boston we find that the so-called "arrested" cases which return to bad social conditions soon come back for treatment to our hospital for advanced cases, and finally die of the disease.

Insistence on the fact that tuberculosis is a special disease of the poor is most important. If tuberculosis laid its burdens on the well-to-do, as it does on the poor, long before this the nation would have awakened to its

responsibility to apply methods to prevent the spread of the disease and not to play at preventing it.

Because tuberculosis is a disease of the poor, not more than 25 per cent. of those who die of it every year are personally circumstanced to care for themselves, or have relatives and friends to care for them, so that they may be without danger to their immediate family or the community. This 25 per cent. of the tuberculous who can care for themselves should be allowed to die at home.

We find that advanced cases average to stay in the hospital about one hundred and ten days each.* This enables each bed to be used for three dying patients a year. If, therefore, we build advanced hospitals in each community with bed capacity for 25 per cent. of the persons who die of tuberculosis annually, we will provide for 75 per cent. of all that die; and with the 25 per cent. who can die at home without danger to the community we will meet all our present needs. We need at least 40,000 hospital beds for advanced cases in the United States, and, as experience shows that a consumptive will not voluntarily leave home to die, these hospitals must be erected in, and maintained by, local communities of 5000 or more. There is no city or town in the United States of this population so poor that it cannot afford to erect such hospitals, which, without considering the diminution in human misery, will pay for themselves a thousand times over in the reduction of the waste from tuberculosis.

We must stop the erection, at government, State, or municipal expense, of sanatoria for ambulant cases, and direct all our energies to the advanced cases. The total number of beds now in the United States (26,360) will accommodate only two and one-half per cent. of the total sick, and only 16 per cent. of those who die each year, and these beds could not be used for dying cases, for they are in the wrong place—not near the homes of these dying cases. In an outbreak of diphtheria, scarlet fever, or smallpox, what would be said of the sanity of health authorities who would quarantine only the milder cases, and throw no restrictions around the advanced and dangerous ones? Dr. Koch, before he died, Dr. Welch, of Baltimore, Dr. Flick, of Philadelphia, Dr. Freund, of Berlin, and practically all the other acknowledged authorities now believe that the time has come to stop building sanatoria.†

The attempt to stimulate the building of beds for advanced tuberculous

* Report of Massachusetts Commission, 1910.

† Dr. L. T. Flick, Fifth Annual Report of the Henry Phipps Institute, pp. 58 and 59. Dr. Richard Freund, Report for the Eighth International Anti-Tuberculosis Conference, Stockholm, July 8, 1909.

cases by a State subsidy to cities and towns erecting such hospitals is not economic, because it will only take money out of one pocket to put it in another. If municipalities have no local interest to build hospitals, a State subsidy, which will come back to them later in increased taxes, will not be likely to compel action. If a private fund was created for this purpose similar to that given to Sweden by the late King Oscar, it might and probably would, bring results. If a rich man or woman or a group of rich persons will set aside $10,000,000 to be divided among the States to be used to pay one-half the cost of erecting local hospitals for advanced cases, it would give an impetus to this work which would immediately show results in diminishing the death-rate, and would bear its great fruit in saving from consumptives' graves millions who, under present conditions, will later become victims of this scourge.

A necessary adjunct to local hospitals for advanced cases, which can be established at small cost, is the dispensary, where all persons who fear they have tuberculosis may come and be examined, and from which will go forth the nurses and doctors into the homes, teaching the sick how to care for themselves and the well to protect themselves and those not yet contaminated. Those suffering from tuberculosis, but not confined to their beds and able to care for themselves, must be taught not to spit on the street or in the house, and to protect the rest of the family by the use of separate dishes, and under these conditions are not a danger to the community. When they reach the dying stage, if they cannot be properly treated at home without danger to the family, they should be removed to the isolation hospitals to be provided in each locality.

The next step should be the establishment of a thorough general medical inspection of school-children, under the control of the educational authority, to detect and treat those who are below physical par, so that they may be safeguarded during their school years from the diseases which, once they go out into the world to earn their living, show their horrible fruit in the spread of consumption. To neglect the child until it gets sick, or is turned out at fourteen to make its living, is a crime against the child, and it is economically foolish because it wastes our educational investment.

We will solve the tuberculosis question when we settle the problems of child labor, city congestion, low wages, long hours, and bad factory and home conditions, and not before; yet the campaign against tuberculosis has been monopolized by the physician and charity worker. This is essentially a business man's crusade, and should be led by the Chambers of Commerce

and business organizations of the United States. Cleveland is showing the other cities the way.

Physicians are taught that their first duty is to relieve suffering. Doctors do more for the public for nothing than any other class in the world, but their training forces them to concentrate their minds on the present and devote all energies to relieving present suffering. The profession is notoriously divided into cliques, because of which no effective support has been, or can be, given to the most meritorious act now pending before Congress: to establish a National Department of Health, which will, in a broad, scientific way, consider the extent and remedies for the waste from preventable diseases. Such a department could collect statistics and recommend action by States that would produce results; but the charlatans, quacks, patent-medicine murderers, and swindlers of the public have been able to play the doctors against one another to prevent the enactment of this needed law by Congress. Until the physicians who control the medical profession in the United States are willing to rise above the prejudice of their schools, I am afraid such a law never will be passed. All the campaign against preventing disease needs is a department organized on the lines of the Department of Agriculture, to do for men what the nation now for business reasons does.

In addition, the campaign against tuberculosis will not be on a sound basis until it is separated from charity. Aid given to a consumptive should be regarded as reparation by the State to a victim of its neglect. Dependence on clinical medicine and charity to supply palliatives when preventive measures are necessary is only to keep on analyzing the stream at its mouth, when we should clean it at its source. Organized charity shows, by many signs, that it is attempting to monopolize not only the philanthropies of the charitably disposed, but the whole field of economic and political reform, and, unhappily, are tending to demonstrate in their work all the waste, duplication, and extravagance they so strongly condemn in others. The existence of huge charitable funds, workers, and distributors creates a demand and taste for more funds, workers, and distributors, and the tuberculosis campaign suffers as common sense, science, and economic efforts are thrust aside for impulse and emotion. The consumptive looking for the just means of restoring himself to economic efficiency has charity and dependence thrust upon him.

Charity, in its true sense, rightly conceived and rightly administered, is one of the highest and noblest activities of human society, and the large mass of this charity army are true servants of the Master; but they are

today suffering from the activities of a minority whose disguised socialism is a menace to society. Even worthily conceived philanthropies, such as the great charity funds, may, under improper management, prove to be the most dangerous trusts the country has ever seen.

Dr. Allen, in the last issue of the Annals of the American Academy, commenting on the statement of John D. Rockefeller that "there will never be money enough to do the world's uplift work," says that in this statement Mr. Rockefeller "started in motion forces and doubts and compromises that will do vastly more harm to the South than the hookworm." Dr. Allen, in my opinion, is right when he says that there is plenty of money to do the work right.

Dr. Allen, in the same article, also asks if it is really true that rich men and women prefer to spend money on curing a handful rather than protecting a townful, or on training a few medical students rather than training a nation. His answer to his own question is "No." They give because they are not well advised, and their advisers to date are the charity workers and the doctors.

In the fight against tuberculosis the charity worker and the doctor should occupy the position of the nurse on the battle-field, caring for the wounded who fall in the fight. The generals in this army fighting against tuberculosis should be the great commercial and business organizations which will approach this question from its economic standpoint, and reorganize the work so that it shall not be confined to present relief, but aimed at future prevention.

At the tuberculosis conference held last year the note was struck that inasmuch as the donations to tuberculosis work from private sources during the last decade had failed to show results, contributions growing smaller and being more reluctantly given each year, we must in future turn our energies away from soliciting money to voting money. This idea of using public money to improve the condition of the consumptive is wholly in line with the radical tendency of our time, and is only an attempt to employ, for the benefit of the consumptive, a practice long popular with the tariff-favored trusts and illegal corporations. The trouble with this theory is that in political economy two wrongs do not make one right.

If we could take by taxation, and restore to the nation to apply to the extinction of the white plague, the unlawful gains of the illegally managed corporations or the tariff favored trusts, little objection would be made; but the fact is, when the revenue of the state is employed to subsidize individuals, even so pathetic and needy a class as the tuberculous sick, it will not be the

rich, but the poor, that will be taxed; and such remedy would only increase the social disorder which is the cause of tuberculosis, strictly a social disease. Our danger is as old as civilization. We see the misery and suffering all about us and are eager to bring relief to those in distress. We would not be human if we did not sympathize with this suffering, but in our zeal, let us not forget that it may be possible to do more harm by the misdirected action of the emotional than by the cruel inaction of the callous and heartless. The misery of tuberculosis is great, but it is not to be measured by the pain and anguish of future generations that will follow unconsidered and uneconomic action now. The real remedy is for a few years to forget, as far as possible, the present, fix our attention on the future, and ask ourselves, not how the suffering of the day may be relieved, but how the suffering of the morrow may be prevented.

During the period of our great industrial development in the United States we have allowed victims of industrial accidents to be thrown on the scrap-heap like so much junk. The manufacturer cared for the broken machinery because he saw it was costing him money, but the broken man was thrown away because he did not realize that this waste finally came back as a charge to his own pocket. In the last few years, however, business men have waked up to the waste from occupational accidents and diseases, with the result that today the movement for proper workmen's compensation laws is extending all over the United States, and many states have already enacted legislation, and practically all the industrial states are considering it. Workmen's compensation is, however, only one phase of the question of human waste, and not the most important one. When we can stir similar interest in tuberculosis among business men because of its cost, we will get similar results. At Philadelphia, a few weeks ago, the Academy of Social Science gathered together economists from all over the United States to consider workmen's compensation, but no consideration was given to the other human wastes. A fortnight ago in New York a Housing Convention paid special attention to the evils of congestion, which is the great cause of tuberculosis. Labor unions too rarely discuss health at all, yet preventive disease means to them each year the equivalent of a 10 per cent. decrease in wages. Last week a great Congress of Charities was held in Boston to discuss the general question of charity. All these conventions discuss many of the same problems, but there never come together under one roof persons with knowledge or authority whose business it is to discuss all these questions in their relation to each other. While we continue to discuss tuberculosis here, charity in Boston, workmen's compensation in Phila-

delphia, housing in New York, the result is chaos. If we could only get together, we would probably attempt to do less, but we would accomplish more.

The sufferer from consumption is the object of our care because he is our brother and akin to God. Our fight would be justified on the humanitarian ground that as we lengthen human life, prosperity and happiness increase; but if we refuse to recognize the obligations of a common brotherhood, the contest is still necessary, because this disease is too great an economic burden for the nation to bear. To accomplish the desired end we must take the steps necessary to make the tuberculosis crusade a great national business movement, based on our economic needs. In this work the doctor and the charity worker must not lead, but follow. Under such conditions it will be possible to exert pressure on Congress to create a National Department of Health, which will have the backing and coöperation of the commercial organizations of the United States. When we do this, and not before, will we have reason to hope that the war against the white plague is on the final road to success.

AN ECONOMIC STUDY OF 500 CONSUMPTIVES TREATED IN THE BOSTON CONSUMPTIVES' HOSPITAL

By Edwin A. Locke, M.D., and Cleaveland Floyd, M.D.

Boston

The present study was undertaken with the purpose of gaining some definite idea of the total economic losses to the community resulting from the disease among patients treated in the Boston Consumptives' Hospital during the first five years of its work. The cases selected were all male adults. In order to make the test as general as possible, they were taken at random, covering the period from the first clinic day, September 11, 1907, to January 31, 1910. No selection was made, all cases which could be found and satisfactorily investigated being included. Each individual case was personally investigated with regard to all the points considered in this report by the out-patient nurses, under the direction of Mrs. King, a trained social worker.

In a study of this kind it is obviously impossible to investigate all the elements which make up the total economic losses, and in consequence our results, we believe, represent the minimum. The cases included are, for the most part, individuals low in the economic scale, and such facts, therefore, as the expenses to the individual during illness are relatively insignificant, since medical care and medicines were, as a rule, provided by public charity. Neither these nor the expenses incident to death are included.

The figures given apply only to the actual losses occurring during the course of the disease, and terminating at the time of death of the individual. No account is taken of the potential losses covering a period represented by the mean expectation of life for each age and beginning at the time of death.

It is evident that in the case of those who have died the total actual loss can be determined, while for those still living the figures must be incomplete.

We have, therefore, in all calculations separated the two, those for the living covering the period from the onset of the disease to April 30, 1911. The total group of 500 cases included 244 dead and 256 living. The final results from so large a series must correspond very closely to the real average among the working-classes. They cannot, however, be accepted as a basis for general deductions regarding the economic losses for all consumptives, since none of those included are from the well-to-do class.

The actual losses naturally fall upon the community, the individual, and the consumptive's family, and it is under these three heads that our figures will be discussed. Such a division is, of course, an arbitrary one, and unsatisfactory, since the loss to the individual as well as to the family must also be regarded as an indirect loss to the community.

GENERAL CONSIDERATIONS

All cases were selected without reference to the stage of the disease at time of observation, but the final results show the following:

	Dead	Living	Total
Stage 1	15	70	85
Stage 2	113	143	256
Stage 3	116	43	159
Totals	244	256	500

It might naturally be inferred that, in the case of those coming under treatment in the first stage, the length of life would be greater than in the case of the other two, and the financial losses correspondingly greater. An examination of the several groups, however, does not show this to be the case—in fact, exactly the opposite is true in many instances. Many of those in the third stage, for example, largely, it is probable, by reason of a high degree of resistance to the disease, lived for a much longer period than many in the first stage, whose disease progressed rapidly and resulted in death at a much earlier period. On the whole, there seemed to us no advantage in grouping the results according to the stage of the disease.

The statistics regarding the age at onset are given below:

Age Period	Number of Cases	Percentage
15–19	32	6.4
20–29	143	28.6
30–39	166	33.2
40–49	105	21.0
50–59	41	8.2
60–69	12	2.4
70+	1	0.2
Total	500	100.0

These figures are in accordance with the generally accepted fact that pulmonary tuberculosis is especially prevalent in early adult life or during the active working period. It will be seen that 28.6 per cent. were between the ages of twenty and twenty-nine; 33.2 per cent. between the ages of thirty and thirty-nine; 61.8 per cent. between the ages of twenty and thirty-nine; 89.2 per cent. were under fifty. The average of the 500 cases when the patient first came under observation was 34.85 years, and the average age at time of death of the 244 fatal cases, 36.21 years. The latter figure corresponds very closely with the general average age of 37.6 for male consumptives at the time of death, as given in the Mortality Statistics, 1906, and quoted by Fisher,* and with the average 36.7 determined by Price† for male consumptive workers in Maryland.

The type of work done by the 500 men was exceedingly varied, being given under nearly 100 different heads. The occupations most commonly noted were as follows: Laborers, 56; teamsters, 49; tailors, 38; machinists, 23; painters, 21; clerks, 21; carpenters, 13; longshoremen, 13; printers, 10; shoemakers, 9.

LOSSES TO THE INDIVIDUAL

The average duration of the disease in the 244 patients who died, as given in Table I, was approximately two years and one month, and of the 256 living May 1, 1911, two years and ten months. These averages are somewhat smaller than those ordinarily given. For example, from a study

* "The Cost of Tuberculosis and its Reduction," Transactions of the Sixth International Congress on Tuberculosis, 1908, v. 3, p. 8.

† "Study of the Economic Course of Consumption in Wage Earners," Journal of the American Medical Association, 1905, v. 44. Cited by Fisher.

of 1000 cases treated at the Adirondack Cottage Sanatorium who subsequently died Baldwin* found that the average duration was as follows: Incipient stage, about eight years; moderately advanced stage, between five and six years; far-advanced stage, a little over four years. It cannot be questioned that our figures for the duration of the disease as given above are much too small. In our experience, dispensary patients seldom realize that they are sufficiently ill to visit the clinic for examination until the disease is well advanced. This is well illustrated by the fact that in 188 out of the 500 cases the date of onset of the disease was stated by the patient as the same as that of giving up work. Furthermore, unfavorable social conditions, so commonly present in this class of cases, must exert a strong influence in shortening life.

Among the fatal cases, the longest duration of the disease was fifteen years, while in 5 cases it exceeded eight years. The greatest duration in the second group was thirty years. A second was given as fifteen and a third as twelve years. Ten cases gave a history of more than eight years.

Theoretically, the time of onset of the disease until death may be divided into three periods, as suggested by Price: First, working period, or period of unimpaired earning capacity; second, period of partial disability; and third, period of complete disability. Among the poor, at least, nearly all sooner or later cease to be producers and wage-earners, and become dependent on the State for support. Our figures show that a majority of the 500 cases investigated ultimately reached the stage of dependency.

Only 60, or 13 per cent., of the total number passed through the period of partial working capacity, a fact which is readily explained by the pressure of necessity, which forces the individual to continue at his occupation until completely incapacitated. In consequence, the consumptive of the working class usually passes directly from the first to the third period. A further explanation is also found in the difficulty which is commonly experienced in securing suitable work for the individual handicapped by tuberculosis. Perhaps also the fear of contagion may lead to discrimination against such unfortunates.

Reference to Table I shows that all the 244 cases who died and 251 of the 256 living on May 1, 1911, finally reached a condition of complete disability. In the former group the average duration from the onset of the disease to giving up work was 39.89; in the latter, 56.08 weeks. An examination of the individual cases shows variations within very wide limits, the maximum in a single case being twenty-seven years. While a few con-

* "Modern Medicine," Osler, v. 3, p. 299.

tinued at their regular occupation for a considerable number of years, the majority worked but one or two years after the disease was diagnosed. Only twelve of the 500 cases worked for six years or longer after onset.

TABLE I.—DURATION OF DISEASE AND LOSS IN WAGES

500 Male Consumptives	Number	Average Duration of Disease	Number Giving Up Work	Average Time of Onset to Complete Disability	Average Time of Complete Disability	Average Rate of Wages Lost	Total Loss in Wages
		Weeks		Weeks	Weeks	Per week	
Dead...	244	98.82 (To May 1, 1911)	244	39.89	58.03	$11.89	$170,965
Living..	256	145.38	251	56.08	89.30	$11.38	255,074
Totals	..	..	495	..	..	..	$426,039

The average period of complete disability in the group of fatal cases was 58.03 weeks, and for the 251 living who stopped work, 89.3 weeks. It will be noted that in both instances the period of complete disability was of considerably longer duration than the working period. Another interesting fact is that the duration of the period of complete disability is less variable than in the case of the period of unimpaired working capacity. The longest recorded period in this series of fatal cases is ten years, and the second longest eight and one-half years, while but 27 survived three years or longer, and 19 four or more years after entering this period. Seventy-seven of the total 495 who stopped work subsequently returned.

The rate of wages among the 500 patients, while ranging from two to thirty dollars per week, was with few exceptions surprisingly uniform. Sixty-one received six dollars or less per week, 104 more than six, but less than ten dollars, per week, and 335 ten or more dollars per week. The average rate of wages for the fatal cases was $11.89, and for the living $11.38, and the total wages lost $170,965 and $255,074 respectively. Of the total $426,039 lost, $88,560 was contributed by the 27 cases who were unable to work for a period of three or more years. The maximum loss is shown in the case of a stone-cutter who, after a short illness, was obliged to give up his regular work with wages of $25 per week. His total loss in the past ten years, therefore, represents a total of $13,000.

LOSSES TO THE COMMUNITY THROUGH DEPENDENCY

Although every case was investigated personally by the visiting nurses and through the records of the Associated Charities with reference to public or private aid, the results given are doubtless far from complete. This is especially true of the latter type of aid, as in many instances the patient was loath to give the information desired or could not recall accurately the facts. In consequence of this and the fact of the great variety of forms, we are unable to furnish exact figures for the total amount of private aid given. Our records show a great variety of material assistance. Public aid other than care in public institutions comprises various forms of aid on the part of the Overseers of the Poor and milk from the Boston Consumptives' Hospital. The total figures are given in Table II.

TABLE II.—PUBLIC AND PRIVATE AID

500 Male Consumptives	Total Number	Number Receiving Private Aid	Number Receiving Public Aid	Number in Public Institutions	Average Length of Stay	Average Total Cost	Total Cost
					Weeks		
Dead....	244	214	97	175	20.78	$177.56	$31,072
Living...	256	192	88	151	33.00	$284.18	$42,912
Totals .	500	406	185	326	..	..	$73,984

It will be seen that 214 (88 per cent.) of the dead and 192 (75 per cent.) of the living, or 406 of the total 500 cases (81 per cent.), were given assistance from private sources. The exact figures for this form of aid in actual money alone aggregated an astonishing sum, and it is evident that, could the amounts in each case be accurately determined, the total would be appalling.

The number receiving public aid other than care in hospitals was much smaller, *i. e.*, 97 (39.3 per cent.) of the dead and 88 (34 per cent.) of the living, or a total of 185 (37 per cent.). These figures, while probably very nearly representing the total number, cover so great a variety of forms that they cannot be combined and expressed as actual cost in dollars.

The most important and interesting figures in Table II are those regarding the cost of maintenance in hospitals. These show, as in the case of the private and public aid, a considerably higher percentage among the fatal

cases, *i. e.*, 175, or 72 per cent., as compared with 151, or 59 per cent., among the living. Three hundred and twenty-six, or 65 per cent., of the total 500 cases were cared for in public hospitals for varying periods.

The average length of stay of the 175 fatal cases was 20.76 weeks, and the average total cost $177.56, making a total cost for the entire group of $31,072. For the 151 living, the figures are: Average length of stay, thirty-three weeks; average total cost, $284.18; and total cost $42,912, making a total cost for both groups of $73,984. It should be borne in mind that this figure does not include any allowance for the original cost of the hospital in any case, but only the regular average cost of maintenance. Were it possible to estimate the proportional cost of construction and to apply this in each instance to the above figures, the final result would be very greatly augmented.

Taking the 17 cases showing the longest residence in public institutions the total cost of maintenance alone in each is as follows: $1703, $1560, $1490, $1133, $1124, $1123, $1100, $1040, $1002, $997, $967, $910, $819, $807, $790, $763, $486.

LOSSES TO THE FAMILY

Among all diseases, tuberculosis undoubtedly occupies first place in its unfortunate influence on the family of the victim. Not only does the family suffer severely in many instances from losses of its members through death from the disease, but also to a very great degree from exhaustion of its material resources. The chain of unfortunate consequences to the individual seem to us secondary in importance to those of the family unit. These results are too well known to require illustration, but the figures given in Table III furnish definite data of a very striking nature, showing especially the descent in the scale of economic welfare dependent on tuberculosis.

TABLE III.—FAMILY AND FAMILY INCOME

Number without family or dependents	78
Number with family or dependents	422
Average number in family	4.39
Total weekly income families before onset of illness	$6807.29
Average weekly income families before onset of illness	$17.50
Total weekly income families after disability of patient	$3055.60
Average weekly income families after disability of patient	$7.86
Total number families without income after disability of patient	161
Total weekly income families of same group before disability of patient	$1877.75

It seems somewhat surprising that but 78, or 15.6 per cent., were without family or dependents, a fact which indicates the far-reaching influence of the disease on others than the consumptive. The average number in the family of the remaining 422 cases was 4.39, which families alone represent 1853 individuals necessarily more or less affected by the ill health of the consumptive member. In 180 of these families the patient was the sole wage-earner, and with comparatively few exceptions the contribution to the family income by other members was small. The direct result on the family income of the disability of the chief bread-winner is well shown by the comparison of the total and average weekly income of the 422 families before the onset of illness and after the beginning of the stage of complete disability. In the first instance the total weekly income from all sources was $6807.29, or an average of $17.50, while in the latter the total weekly income was only $3055.60, or an average of $7.86—a decline of 65 per cent.

One hundred and sixty-one families were without income of any sort during the period of complete disability of the patient, while the total weekly income previous to this stage was $1877.75. In 90 families the burden of support was wholly or in part assumed by one or more other members—usually the wife—not previously working. A few families were found where the attempt was made to replenish the family treasury by taking lodgers. The reports on the home conditions which we have obtained have very generally indicated a more or less rapid descent of the family in the economic scale, other than in the respects mentioned above.

DISCUSSION

The foregoing tables show that the total losses in wages, together with the cost of care in public institutions, of the 500 consumptives represents an aggregate of $500,023. Considering the fact that this figure does not include the cost of private or public aid other than hospital care, the numerous expenses incident to illness and death, or the potential loss occurring after death, its full significance is apparent.

For reasons stated earlier in this report the series of 500 cases may, we believe, be accepted as typical of the male adults observed in the outpatient department of the hospital. During the first five years of the existence of the hospital, the period covered in this study, a little over 1600 positive cases among males of the working age registered. On this basis, then, the total loss in wages and cost of hospital care represents more than a million and a half of dollars. If to this could be added similar cost

for the tuberculous women and children registered at the out-patient department during the same period, the figure would be greatly increased.

Even so grand a total represents but a small percentage of the total cost of tuberculosis in our dispensary cases, since it does not include the loss to the community represented by the "capitalized value of the earnings cut off by death." Accepting Fisher's figure of $5600 as representing the minimum average value of each life cut off by tuberculosis, we find that the total potential loss in the small group of 244 fatal cases is approximately $1,366,400.

The significance of these calculations when applied to the total of 3066 cases treated in the Boston Consumptives' Hospital is evident. It cannot be doubted that the aggregate must represent many millions of dollars. It should further be emphasized that a conservative estimate places the total number of consumptives in Boston at 15,000 as a minimum, or about three times the number treated in this institution.

The close study of the tuberculosis problem during recent years leaves no possible doubt that the most effective and important method of diminishing the ravages of the disease lies in the measures for prevention of its spread. Newsholm has especially shown that the most marked fall in death-rate from consumption has occurred in those communities where the provisions for the isolation of the advanced cases have been proportionately greatest. The most prolific source of infection is the consumptive, and in the majority of cases it is only by removing him from his home, and thus reducing the dangers to others associated with him, that prevention can be brought about. The cost of the erection and maintenance of hospitals for the incurable in sufficient numbers to be effective, however, means enormous expenditures, and the question has naturally been asked, "Do the results justify such expenditures?" Such statistics as those given above furnish the best answer to this question. In these figures is found, we believe, the most complete justification for the money already expended in the campaign in Boston.

A SURVEY OF DUNN COUNTY, WISCONSIN

By Hoyt E. Dearholt, M.D.
Milwaukee

The Wisconsin Anti-Tuberculosis Association has been engaged during the past year in a series of community and rural investigations of the conditions which are responsible for the existence and continuance of the tuberculosis problem in Wisconsin. Nine cities of varying size and geographical distribution have been studied, in addition to the rural county investigation upon which this report is based.

Dunn County was chosen for the rural investigation because it presented a fair type of Wisconsin agricultural county in which the death-rate from tuberculosis is not out of proportion to that of the state at large. Conditions there as regards prosperity, intelligence, nationality, education of its residents, etc., are generally considered by those who know their state to be representative. Menomonie, the one incorporated city in Dunn County, has a population of but 5500; Colfax, the one incorporated village, a population of but 600. The remaining settlements contain but a few scattered families. It would be difficult to find an agricultural county less influenced by urban culture or urban vices. Neither the city nor the village was reckoned in the findings, in order that this study might serve, as well as possible, as an undefiled picture of the rural tuberculosis situation in Wisconsin.

The field work was in direct charge of a well-trained sociological student and experienced field worker, Mrs. Robert Pinkerton, until recently a member of the staff of the Wisconsin Anti-Tuberculosis Association. The survey was undertaken during the winter months, and entailed much hardship on the part of the young women who were compelled by their task to take long, cold drives, with uncertain meals and uncertain lodgings ahead. The schedule employed was the one used throughout our investigations, and thus affords ready comparison of data with that obtained in the composite city findings. The form is a comprehensive one, covering over 50 specific

queries and observations upon dwelling conditions, economic conditions, and medical history.

In the time available it would be utterly useless to attempt an exhaustive or thorough discussion of all the data collected. It seems warrantable, therefore, to record conclusions based upon evidence, which, out of regard for brevity and a sense of proportion, is not included here.

From death records, for which we are indebted to city and local boards of health, we found that there had been, in the past decade, a total of 265 deaths, divided into two five-year periods as follows: From 1901 to 1905, 131 deaths; and from 1906 to 1911, 134 deaths. Schedules were secured from the family and friends of 228 of the 265 recorded deaths. Inasmuch as registration, while made mandatory by Wisconsin statute of 1907, had never been made in a single instance in Dunn County, it was necessary to secure names of living patients from physicians, friends, and through neighborhood gossip. Of the 77 names of living patients thus reported, 67 schedules were secured, making a total of 295 schedules.

The accompanying map of Wisconsin counties (Plate I) affords an opportunity of comparing the county death-rate with that of the remaining counties of the state. Dunn County will be seen to have a death-rate of less than 8 per 10,000 population, which is indicated throughout by absence of shading. The counties having a death-rate of from 8 to 13 per 10,000 population are indicated by parallel line shading; from 13 to 18, by cross-hatch; from 18 to 23 by solid black.

Similarly, but upon a different arbitrary division, the township map of Dunn County (Plate II) has been prepared. Those townships in which there is an absence of shading on the map have a death-rate below that of the state rate of 10.7 per 10,000 population. Parallel line shading represents a rate of from 10.7 to 16.7; cross-hatching, a rate of from 16.7 to 22.7, while solid black represents a death-rate of from 22.7 to 28.7

We are not unmindful of the fact that these percentages, and others recorded throughout this paper, are based upon an exceedingly small number of deaths; that a single faulty or suppressed certification of the cause of death might alter the picture considerably. In working with small units, however, this is unavoidable. In all our computations we have guarded, as much as possible, against the danger of deception by making averages over as long periods as practicable. A comparison of the death-rates in the two five-year periods is shown in Plate III, and the relation of the various townships to one another is interesting and instructive.

It will be seen that the general tendency is toward an increase in the

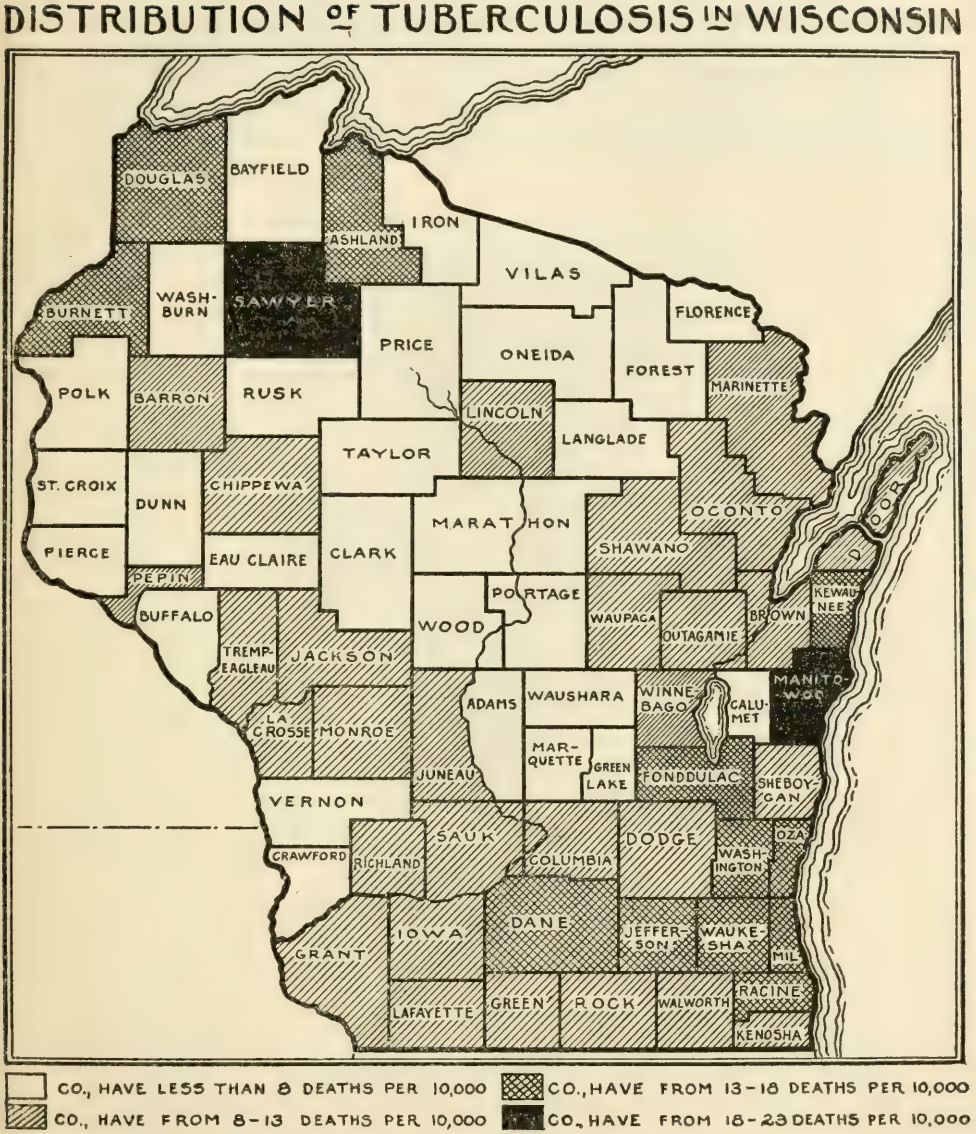
DISTRIBUTION OF TUBERCULOSIS IN WISCONSIN
DOUGLAS
BAYFIELD
ASHLAND
IRON
VILAS
FLORENCE
BURNETT
WASH-BURN
SAWYER
PRICE
ONEIDA
FOREST
MARINETTE
POLK
BARRON
RUSK
LINCOLN
LANGLADE
TAYLOR
ST. CROIX
DUNN
CHIPPEWA
MARATHON
OCONTO
DOOR
PIERCE
EAU CLAIRE
CLARK
SHAWANO
PEPIN
PORTAGE
KEWAU-NEE
BUFFALO
WOOD
WAUPACA
BROWN
OUTAGAMIE
TREMP-EALEAU
JACKSON
MANITO-WOC
ADAMS
WAUSHARA
WINNE-BAGO
CALU-MET
LA CROSSE
MONROE
MAR-QUETTE
GREEN LAKE
FONDDULAC
SHEBOY-GAN
JUNEAU
VERNON
SAUK
DODGE
OZA
CRAWFORD
RICHLAND
COLUMBIA
WASH-INGTON
IOWA
DANE
JEFFER-SON
WAUKE-SHA
MIL
GRANT
LAFAYETTE
GREEN
ROCK
WALWORTH
RACINE
KENOSHA
CO., HAVE LESS THAN 8 DEATHS PER 10,000
CO., HAVE FROM 8-13 DEATHS PER 10,000
CO., HAVE FROM 13-18 DEATHS PER 10,000
CO., HAVE FROM 18-23 DEATHS PER 10,000
1908

PLATE I.

number of deaths during the latter five-year period, indicated by the wavy lines, as against the earlier five-year period, which is indicated by the straight lines. Menomonie, the township lying next to the city, in which the same downward tendency is manifest, is notable.

In Tiffany township it was found that splendid instruction in preventive measures had been given by the physician who has charge of the medical care of the majority of families.

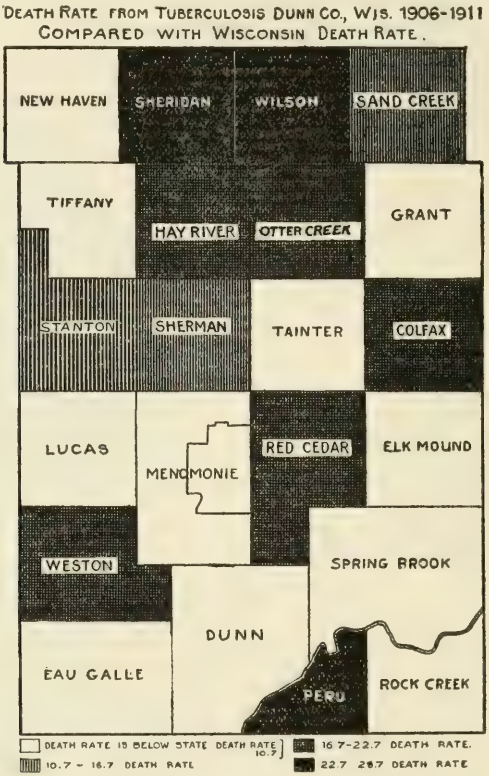

PLATE II.

A spot map of Dunn County (Plate IV) has been prepared, in which the deaths of the last decade and living cases have been charted. Partly for purposes of clear reproduction and partly to safeguard individual patients from being made too easy prey for neighborhood gossip, this map has been redrawn, leaving out the large amount of detail which characterizes a county map.

A ring indicates a death occurring from 1901 to 1906; a dot, a death from 1906 to 1911; a pyramid indicates a living case. Throughout, rings are followed by a cluster of dots or a pyramid. If these are joined, the cases have occurred in the same family. All dots show a decided tendency to cluster in one part of the township. It must be remembered that by far the greater number of townships are only six miles square. A cluster of dots represents cases very near to each other. When placed on the county map,

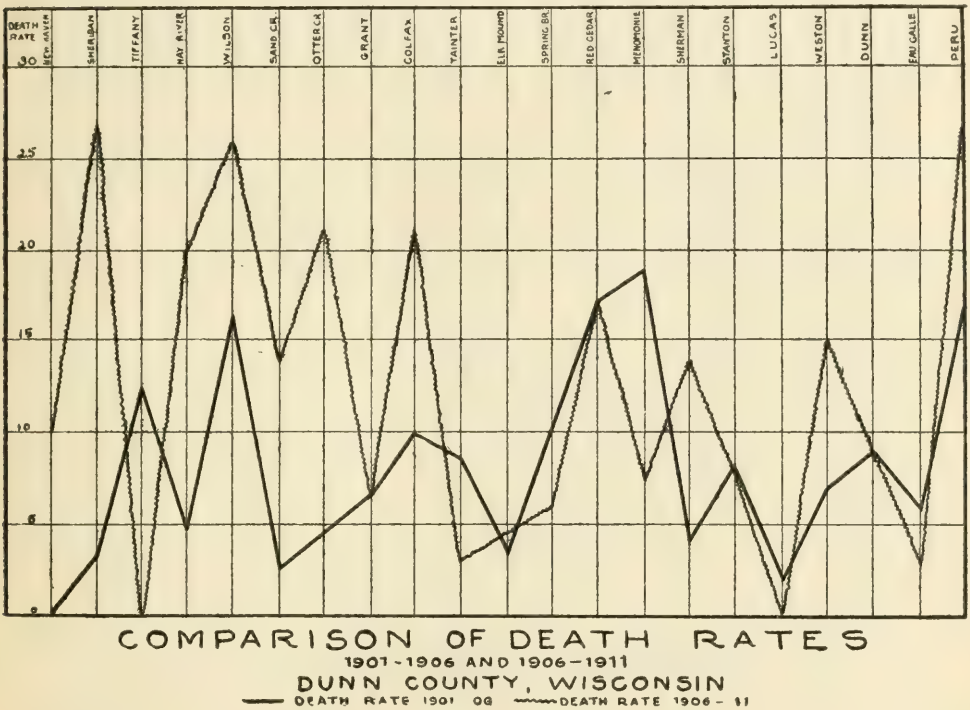

PLATE III.

the dots show a decided tendency to be located just across the road from one another.

During the year 1909 tuberculosis was responsible for 9 per cent. of the total deaths in the State of Wisconsin. For further comparison an average relative rate was struck for the years 1908, 1909, 1910, of the Dunn County townships. In only two townships, Wilson and Otter Creek, is the relative position changed from that based upon percentage of population. Whereas

the rates per 10,000 population are respectively, in the period of 1905–1911; 26 and 21, the ratio to the total number of deaths is respectively 7.6 and 8 per cent.

The above serves to demonstrate that there are 10 townships in Dunn County in which the death-rate is higher than that of our most populous

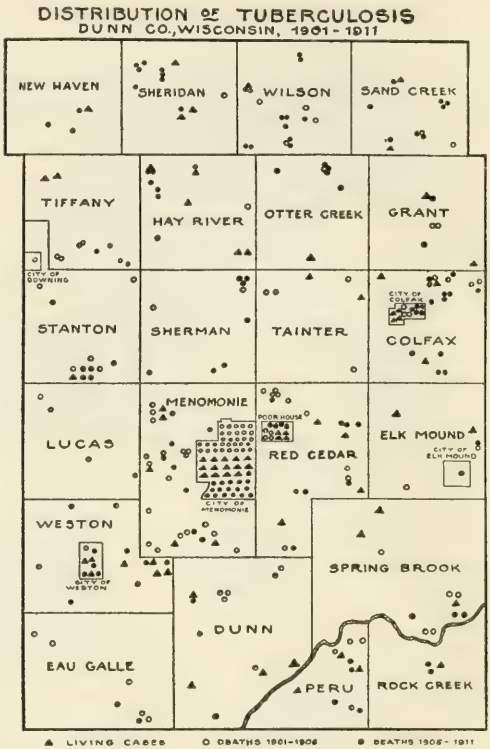

PLATE IV.

city, Milwaukee, and higher again than the following lesser cities of Wisconsin in which we have conducted investigations—Ashland, Superior, Eau Claire, Oshkosh, and Fond du Lac.

In the city of Menomonie there has been a decided decrease in the number of tuberculosis deaths. The rural portions present a relative increase, which will account for the remarkably stationary rate of the county as a whole.

TOWNSHIP STATISTICS ON TUBERCULOSIS BELOW STATE RATE

	Estimated Population, 1910.	Annual Average of Tuberculosis Deaths, 1901–1906.	Average Rate Per 10,000, 1901–1906.	Annual Average of Tuberculosis Deaths, 1906–1911.	Average Rate Per 10,000, 1906–1911.
Dunn	1,111	1.00	9.00	1.00	9.0
Eau Galle	1,498	1.00	6.00	0.05	3.0
Elk Mound	1,054	0.04	3.70	0.05	4.7
Grant	739	0.04	5.40	0.05	6.7
Lucas	745	0.08	1.07	..	..
New Haven	780	..	..	0.80	10.2
Rock Creek	696	0.00	..	0.05	7.1
Tainter	610	0.06	0.90	0.20	3.0
Spring Brook	1,267	1.00	7.80	0.80	6.2

TOWNSHIPS IN WHICH TUBERCULOSIS DEATH-RATE IS ABOVE STATE DEATH-RATE

	Estimated Population, 1910.	Annual Average of Tuberculosis Deaths, 1901–1906.	Average Rate Per 10,000, 1901–1906.	Annual Average of Tuberculosis Deaths, 1906–1911.	Average Rate Per 10,000, 1906–1911.
Colfax	1,387	1.40	10.0	2.8	20.1
Hay River	804	0.04	4.9	1.5	18.6
Menomonie	1,911	3.60	18.8	1.5	7.8
Otter Creek	458	0.02	4.3	1.0	21.8
Peru	365	0.06	16.4	0.9	24.6
Red Cedar	1,235	2.40	19.4	2.2	17.8
Sand Creek	858	0.04	4.6	1.2	14.0
Sheridan	691	0.02	2.8	1.9	27.0
Sherman	878	0.04	4.5	1.2	13.6
Stanton	1,378	1.60	11.6	1.2	8.0
Tiffany	967	1.20	12.4	0.2	2.0
Weston	1,267	1.00	7.8	2.0	15.0
Wilson	788	1.00	12.6	2.1	26.0

Having demonstrated that there is a tuberculosis problem in the rural townships of relatively equal and, in many instances, of greater extent than that of many of the larger cities, we are ready to proceed to an attempt to fix the responsibility.

The conditions commonly held to be responsible for the spread of tuberculosis have been:

1. *Direct communication* of the disease to those in close association with the patient through any medium which might convey living bacilli.

2. *Indirect communication* through —(*a*) latent house contamination; (*b*) neighborhood contamination.

Contributing to the direct and indirect transmission of the infecting

agent, the most important factor is malnutrition, generally attributed in the studies on the social aspect of the disease to poverty, which in turn is held responsible for insufficiency of raw food, congested tenements in which ventilation is impossible and sunlight well-nigh unattainable.

In what respects does the rural situation coincide with, or depart from, our present conceptions of tuberculosis as a disease of society, which conceptions have, for the most part, been based upon studies made in thickly populated districts?

There will follow many comparisons between rural and city findings. These comparisons are made with our own city figures collected under similar circumstances. This should tend to balance, for practical purposes, the element of error or personal bias.

CONTAGION

Recurring to the spot map showing the location of living cases and deaths in the past decade, the picture is similar to that presented in an area of city blocks. The evidence of family and possible neighborhood contagion is manifest, and need not be dwelt upon in this gathering of individuals, to whom such graphic representations are familiar. It is impossible, of course, to determine with any degree of exactness whether or not this transmission of the disease was direct or indirect. It will be recalled that there is in the country a more common interchange of house visits than there is in the city. Frequent moves, on the other hand, are exceedingly unusual in the country, and there is, therefore, little evidence of possible house contagion as it is encountered in the cities. Nevertheless, the following briefly recounted case histories are surprisingly like those met with in city investigations:

Case 1.—A family moved into an undisinfected home in which a young girl had died from tuberculosis. Soon after the father contracted the disease and died. A year later his sixteen-year-old daughter died from the same cause. An elder daughter became ill with tuberculosis, but nevertheless married. She died, and the husband has been pronounced tuberculous. Through the medium of this one undisinfected house tuberculosis may have spread through three families, killed four people, and left one other known living case.

Case 2.—A man died of tuberculosis in 1900. Just before his death his wife contracted the disease. After his death the family moved from this house into a city, where the widow died. The neighbors say that family was careless and ignorant, and there was no disinfection of the house. Another family moved in. The father of this incoming family became ill soon after and died of tuberculosis in 1910.

Case 3.—A young man came from Chicago to live with distant relatives. He was suffering from tuberculosis and soon died. One of the neighbors, in speaking of the case, said: "He was the one who brought the disease to the house." Soon after the young man's death the wife and child of his host became ill and died of tuberculosis. A year went by, and the man wished to marry again, but the mother of the girl he wished to marry said: "You cannot marry my daughter and take her to that house, where she will die"; and so that man went home and disinfected as best he knew how. He whitewashed the kitchen and scrubbed the floors. The mother said the house looked so nice and white that she was satisfied and allowed the marriage. Six months later the second wife became ill with tuberculosis.

Case 4.—Mrs. P. died of tuberculosis. Mr. O. and his family moved into the vacated house. They came from another country, and did not know, or perhaps did not consider, the disease history of the house. There was no disinfection. Soon after the daughter became ill and died of tuberculosis.

Case 5.—A man died of tuberculosis. The house was not disinfected before another family moved in. The husband became ill, and a year later died of tuberculosis. The next year his sister-in-law, who lived near by and was a constant visitor in the home, died of tuberculosis.

Case 6.—A wife died of tuberculosis. After her death there was no disinfection of the house. Her sister came to keep house for the widower. Soon after she had to give up her work and found she was suffering with tuberculosis, and went west with her family. She has since died. Another sister is suffering with the disease, and a brother is a suspected case.

Case 7.—There is a house in one township in which a man died of tuberculosis before 1900. They had no physician, and no disinfection was made. Four years later the brother-in-law died of tuberculosis. Again they had no physician, and the house was not disinfected. The next year his son died in the same room. A year later his cousin, who was accustomed to visit him often and who was the father and sole support of a family of eight, died of tuberculosis. Now the widow and five little children are living in this house.

The comparison of the number of cases manifested in rural and urban families, as shown in the accompanying table (p. 166), would seem to emphasize greater possibilities of family contagion in the country than in the city.

Concerning sanitary regulation, there has, as yet, been practically no official recognition of the responsibility of the local township governments

to provide disinfection after death or other removal, although this again was made mandatory by Wisconsin statutes of 1907. In only two townships has the local health board ordered or borne the expense of disinfection after removal or death of a tuberculous individual. Whatever attempts were made by families themselves, by the physicians, or by the undertakers have been, to a great extent, entirely inadequate, both as to the disinfecting agent used and as to the number of hours employed. On the other hand, the characteristic self-dependence of the farmer is manifest in a greater anxiety to have disinfection done after all contagious diseases than that of his city brother.

FAMILY CONTAGION COMPARISON

No. in Family.	Per Cent. in City.	Per Cent. in Country.
1 case	0.610	0.37
2 cases	0.170	0.31
3 cases	0.100	0.22
4 cases	0.050	0.06
5 cases	0.040	0.01
6 cases	0.007	0.02
7 cases	0.007	0.01
8 cases	0.004	..
9 cases	0.004	..
10 cases	0.001	..

Attention given to the disposal of sputum, both in the yard and in the house, use of separate dishes and their separate washing, the common dipper, and separate bed or bedroom have furnished the basis upon which we have determined the care exercised by the patient or the family to avoid further spread of the contagion. In our total of 1411 cases, both city and rural, we have found that in the cities 76 per cent. observed care in the disposal of sputum at home; 20 per cent., on the street. Of the rural cases, 71 per cent. observed care in the house; 28 per cent., care in the yard. The use of separate dishes by a tuberculous patient was found to be much less common in the country districts. While 36 per cent. of patients in the city observed adequate care in this regard, but 21 per cent. of country cases did so. On the other hand, those using separate dishes in the country wash them separately, whereas in our cases in the city but one-third are washed separately. This may or may not evidence greater intelligence, but less careful instruction.

The common drinking-cup is more prevalent and more dangerous in the

country, where it takes the form of a dipper in the pail which constitutes the water-supply of the house, than in the city, where there is an abundance of running water. But 23 per cent. of rural cases were found to exercise adequate care as against 55 per cent. of our city cases.

HOUSING

With the housing problem as we consider it in the city we see little in the rural districts. Although there are still plenty of the two-room dwellings, they differ in being surrounded by acres of open land. Of overcrowding within the house, the accompanying table shows the condition in the cities

SLEEPING IN ONE BED-ROOM

	Per Cent. in Cities.	Per Cent. in Country.
Patient alone	0.5800	0.473
Patient plus 1	0.2200	0.280
Patient plus 2	0.0500	0.150
Patient plus 3	0.0200	0.047
Patient plus 4	0.0100	0.005
Patient plus 5	0.0040	0.025
Patient plus 6	0.0012	0.005

OVERCROWDING IN THE HOUSE

Per Room.	Per Cent. in Cities.	Per Cent. in Country.
0.5–1 person	0.490	0.39
1 person	0.180	0.14
1–2 persons	0.220	0.23
2–3 persons	0.040	0.12
3–4 persons	0.010	0.02
4–5 persons	0.004	0.01
No report	0.049	0.08

to be rather better than that in the country. Our studies on the cleanliness of houses in the country bear out one's preconceived notions. The findings concerning ventilation are reversed, as will be seen by the accompanying table (p. 168). This is to be accounted for by the fact, which those of you who are familiar with rural social distinctions will recognize, that there is no more arbitrary standard of virtue in a housewife than is the manner and thoroughness with which her home is cleaned. Ventilation, on the other hand, has gained no honor. Indeed, the deep-seated superstitious fear of

"night air" is nowhere so generally embraced or so vigorously and unblushingly proclaimed.

Of the rooms of tuberculous patients upon which we obtained figures, 55 per cent. had two or more windows on different sides of the room, 9 per cent. had two windows on the same side, while 25 per cent. had but one window. Of the one-window bed-rooms, the window in 48 per cent. faced east, in 12 per cent. north, in 14 per cent. south, and in 26 per cent. west.

CLEANLINESS AND VENTILATION

	Per Cent. in Cities.	Per Cent. in Country.
Clean	0.60	0.76
Good ventilation	0.56	0.42
Fair ventilation	0.17	0.25
Bad ventilation	0.26	0.32

CONCLUSION

It will be noted that in the foregoing the economic phase of the tuberculosis problem has been almost entirely overlooked. While there is in rural Dunn County, as elsewhere in Wisconsin and the United States, much poverty in the country districts, it is not commonly, if ever, manifest in a lack of necessary food. Neither is sunlight nor fresh air controlled by prohibitive rental rates. Overwork, while not uncommon in the country, is seldom, if ever, compelled by industrial competition, nor is the laborer driven by a rapacious employer other than himself. Bread hunger is an unknown thing.

What is the great common possession of the countryman and the cityman which can be held accountable for the spread of the disease? Ignorance, with resultant inability to make the most of the opportunities at hand. With an abundance of food, sunlight, fresh air, and a well-nigh perfect opportunity for work under ideal conditions, malnutrition contributes to the direct and indirect invasion by the tubercle bacillus almost, if not quite, as much in the country as it does in the city. Sanitation laws and efficient administrations of public medical precautions and relief are not provided on any such scale as they are in the cities. This is due to community ignorance and not to want of means.

A woeful lack of adequate personal and family preventive measures exists in both city and rural homes. This is due, in great measure, as has been proved by us in a study on the medical phase of the tuberculosis

problem, recently presented to the State Medical Society of Wisconsin, to primary ignorance and incompetence of a considerable percentage of practitioners of medicine.

The above sketchily presented testimony and running comment may not establish, but still tends to confirm, the knowledge previously held that a rural tuberculosis situation exists which may not longer be ignored, nor left for solution to the overflow of effort being expended in the cities.

Whatever program is employed in the solution of the rural problem, be it the establishment of local hospitals for advanced cases, sanatoria for the care of early cases, medical inspection of school-children, common school instruction in hygiene, the reorganization of health departments, with employment of inspectors, visiting nurses, lectures, and exhibits, it must be comprehensive enough to take into account every resident, regardless of how far removed he may be from congested community life.

A COUNTY ORGANIZED AND EQUIPPED TO CONTROL TUBERCULOSIS

By George J. Nelbach
New York

A county organized to control tuberculosis should be organized after the fashion of political organizations. Just as our friends, the politicians, have their town, village, and city committees all responsible to a county committee, and that in turn responsible to the State organization, so should we tuberculosis crusaders have our local town, village, and city societies all federated and responsible to a county committee, and that in turn responsible to the State association. Then, if the authorities do not enforce the laws and provide the desired appropriations, we will be in a position to create public sentiment and bring strong pressure to bear upon our public servants, and, if need be, to go into politics ourselves and support the candidates who will legislate, execute, and appropriate in the interests of public health.

It should be noted, at the outset, that the title of this paper expresses a hope, not a fact. Tuberculosis is not controlled today in any county in any State of the Union. I believe I am quite safe in making that assertion. Steps have been taken, and other steps are being taken, which should result, in the course of a few years, in bringing about the organization and equipment of counties to control the disease. Several counties in New York State are organized, but have not as yet, through their organizations, secured the necessary equipment. This no doubt represents the situation in other States. But we should be careful not to confuse hope with accomplishment, or plan with result.

In the Empire State we have come to regard the prevention of tuberculosis as largely a local problem. Every county, every city, and every village lives under conditions some of which are peculiar to that community. There are differences in climate, in the physical and geographical surroundings, in the character and distribution of the population, and in the occupations in which they are engaged. We believe that, at best, it would be

quite difficult for the State government to exercise mandatory control over the whole State in the matter of public health. Particularly is this so where the geographical extent of the commonwealth is large.

We believe that a State department of health and a State anti-tuberculosis association can be of great value in disseminating information, educating local authorities and the people to an appreciation of the seriousness of the situation, and in agitating and directing the enforcement of constructive measures of prevention. But we believe that, after all is said and done, the real success of this movement lies first in the local officer—the local authority who knows local conditions and who is constantly under the observation of the community he is employed to protect; and, secondly, in the energy and enthusiasm manifested by local associations or societies in creating sentiment for the enforcement of law and standing back of the local authority in his efforts to enforce the law and give the greatest possible efficiency to the administration and maintenance of hospitals, dispensaries, and the other curative and preventive agencies.

Our State law requires the notification and registration of tuberculosis cases with the local health officer, and it is the local health officer who must see to the cleansing, disinfection, fumigation, and, if necessary, the renovation of the apartments occupied by consumptives. Local hospital provision was authorized by the legislature of 1909 in a permissive act enabling county boards of supervisors to establish county hospitals for tuberculosis. Accordingly, we are directing our efforts at the county, for it is our local governmental unit, inclusive of cities, villages, and rural districts of the community.

It will be interesting, at this juncture, to state how we go about securing the organization and equipment of a county. The New York State Charities Aid Association, a purely private volunteer organization, is coöperating with the official State Department of Health in prosecuting the work.

The employment of the methods and measures used in New York State is made imperative because of our county form of government. We have no small county commission, such as obtains in other States, made up of from three to five members elected from the county at large, and endowed with both executive and legislative powers. Indeed, we have no executive board or officer in our county form of government. We have simply a legislative body called the board of supervisors, composed of a member from each township in the county, and from each ward of the cities, who are chosen by the electorate of each of the townships and wards.

The number of members on the board of supervisors in the various counties varies according to the population and the geographical extent of the

county territory. The number ranges from 3 members in a very small county to 50 members in a large county. The average county board of supervisors has about 20 members. The rural members usually outnumber those from the cities by a ratio of 2 to 1. To succeed, we must carry the gospel of the cure and prevention of tuberculosis right into the villages and rural sections of the county. We must arouse a county-wide sentiment for the providing of the necessary constructive measures through a county-wide organization. The authorities must be petitioned, threatened, entreated, persuaded, browbeaten, bullied, into doing their duty.

This is how we proceed: The State Department of Health and our Association together send to all the agricultural exhibitions, such as the county and town fairs, an exhibit designed to instruct the laity, and to appeal particularly to those living in the villages and rural districts.

A class of people is reached at these agricultural fairs that cannot be reached in any other way—those coming from the distinctly rural sections of the county—the so-called "backwoodsmen." They are in great need of education along public health lines, and their influence must be won, so that their supervisors will vote favorably. These exhibits also pave the way for the more intensive work done later in the season.

A large traveling tuberculosis exhibition weighing approximately three tons is sent to the principal city or cities in the county, and a series of lectures, meetings, and demonstrations is carried on in each place for a week. Two trained publicity men are sent to the city two weeks in advance of the date of the opening meeting and remain there, carrying on a most striking campaign of advertising. We have been very successful in "getting the people out," so to speak. It is not an easy matter to arouse interest in the prevention of tuberculosis. Many people still regard the disease as hereditary, incurable, and any attempt directed toward its eradication hopeless. Accordingly, unusual methods have to be used to bring the subject before the people. We have been reaching from 52 to 91 per cent. of the entire population of cities, ranging from 10,000 to 25,000 population.

The members of this Association are familiar with the publicity methods used to arouse a city or to awaken a State to a realizing sense of its responsibility, having heard a number of papers on the subject read at the annual meetings of the past few years; and as these papers are all printed in the Transactions, another recital of the methods would be out of place. However, I should like to describe briefly several methods we have used during the past season with good results.

Three banners, 25 feet x 6 feet, are strung across the principal streets in

the business section of the city, and large white pennants bearing the red, double-barred cross take the place of the star-spangled banner on the flagpoles of the public buildings and the private ones, too. Use of every possible means of electrical advertising is made. For instance, in the city of Syracuse the immense repeating electric signs flashed out every few minutes the injunction, "Go to the Tuberculosis Exhibit This Week."

Local bands, donating their services, march and countermarch along the principal streets, accompanied by a boy with a transparency reading, "Come With Us to the Tuberculosis Mass Meeting." In Amsterdam the members of the three local bands massed together and played for us. In Plattsburg the regimental band of the regulars at the army post escorted the soldiers to the exhibit hall, and also played for us on the night of the mass meeting.

Factory whistles were blown, and church bells rung, for three minutes continuously on the opening day. Suitable publicity is given to this last feature through the newspapers, so that the people will grasp the significance of this noisy invitation and not feel that the town is burning up.

The "hello girls" of telephone companies notify all the subscribers that "this is tuberculosis day; attend the big mass meeting at the armory tonight."

These methods, and others that you are all familiar with, are what we call "beating the tom-toms." Many of them are conventional, some are novel, and a few are even bizarre. To some they savor of the undignified, but in this connection we feel that the end justifies the means. These methods get results.

At the climax of the campaign a permanent local committee is organized to work under the direction of the State association and of the county organization, which I shall describe later, and in coöperation with all other city, village, and town committees in the county. This committee is made up of influential, representative citizens, such as public officials, physicians, trades-unionists, club women, priests, ministers, merchants, manufacturers, educators, and social workers.

In organizing our local committees we imitate the methods of the politician. Our men prepare a constitution and a set of by-laws in advance of the meeting for organization purposes, and also prepare a "slate" of officers for the committee, made up of the men and women they feel are most likely to be interested and most active in carrying out the purposes of the organization. Before the meeting takes place our men see that the ways are well greased, so that the committee ship may be launched smoothly without stirring up any ripples of protest or waves of opposition. They select the

right persons to offer the constitution and the by-laws and to act complacently and obligingly on the committee on nominations in charge of the "slate." These methods, I must admit, are not democratic, but they, too, get results.

While the city or cities in the county are being aroused and organized, two, and sometimes three, smaller exhibits are sent to all the villages and townships in the county. These exhibits are designed particularly to show the need for hospital, nursing, and laboratory provision. They are extraordinarily portable. Although taking up 800 square feet of wall space, they can be packed up and shipped in an ordinary sized trunk and in a box 2 x 2 x 10, and the demonstrator can drive from one place to another with the exhibit in the conventional buggy, or check the trunk as baggage and ship the long box by express.

These exhibits are so constructed that they can be adapted to any conditions, however unusual, obtaining in halls, such as are found in rural communities. They are displayed in churches, school-houses, town halls, grange halls, and dance halls. They have also been set up in a number of instances in the court-room of the county court-house at hearings given on the hospital project by boards of supervisors.

So far as possible the methods used to arouse a city are followed out in the villages and rural communities. The country parsons and the school authorities advertise the movement. The school-house bell and the church bell are rung, and the creamery or tannery whistle blows to extend a last invitation to attend the meeting.

These small exhibits remain in a place one, two, or three days, depending upon the size of the community. Toward the close of the campaign a permanent local committee is formed, just as in the city, and the same methods in organizing a city committee are followed out by the exhibitor. He has the constitution and by-laws prepared in advance, and arranges to have his "slate" of officers put through.

Thoroughly to arouse and organize a county requires from three weeks' to two months' work. The exhibiting finished, a follow-up man is sent to each city, village, and township in the county. His work is to organize the county committee. This county organization is necessary in order to stimulate a spirit of coöperation between all the local committees, so that a county-wide demand may be made for equipping the county with the necessary preventive machinery.

The method followed is this: The organizer visits each local committee, states the purpose of the proposed county organization, explains the plan,

and sets forth the opportunities offered and the results that may be secured through a scheme of organization and federation. The plan is to have the members of each local committee declare themselves in toto members of the county organization, and to select three members of their local committee to meet at a central point in the county to organize the county committee. These three members, with similar appointees from the other city, village, and town committees, become members of the executive committee of the county committee, the body that does the work.

The organizer makes it his business to see that the representatives selected by each local committee are those most active in local work, and who would lend dignity and prestige to the broader—the county—movement, and at the same time strive effectively for the accomplishment of the purposes sought.

The organizer must use great care in the selection of the officers. He must see to it that the offices are so parceled out that those from the rural sections and from rival cities and villages are satisfied. Care in this direction will result in the elimination of the feeling among the country supervisors that the movement for the equipment of the county to control tuberculosis had its inception in the minds of the "city folks" who, they might contend, would be the ones chiefly benefited, and had given but little consideration to the real needs of the rural portions of the county. In other words, the movement becomes a movement for the whole county. The members of the boards of supervisors see in the workers in the county organization their own immediate friends and neighbors, their own constituents, those to whom they are looking for sentiment and support.

This form of organization gets results. With every village, township, and city thoroughly organized, and the county itself in turn thoroughly organized, we have in our hands a splendid machine. When the State association and the county organization and all the local committees are set in motion to work for a particular proposition, the sentiment that can be aroused is overwhelming. These methods in New York State have resulted in securing affirmative action on the hospital project from the boards of supervisors in 17 counties; 15 hospitals were assured in fifteen months and 17 in two years.

The county thus organized will soon become the county equipped to control the disease. Each local anti-tuberculosis committee will be the medium through which the county organization and the State association may carry on a continual campaign of education. Each committee will create local sentiment for the enforcement of health laws and sanitary

measures, and will see to a quickening of those charged with local responsibility, and also of those who, by special training and experience, are able to suggest and assist in the application of the particular remedial measures to which the disease must ultimately succumb.

Thus far we have been considering the organization of the county—the organization of the county officially and unofficially—to secure the required equipment for a continuous attack upon the disease.

What should the county as a county do to combat tuberculosis? What should its equipment be? Let us consider the various preventive measures, and determine which of them should be provided by the county.

A program for a direct attack upon the disease, to be comprehensive and effective, must include the following:

1. Reporting and registration of cases.
2. Dispensary provision for diagnosis and direction of treatment.
3. Home treatment, including classes, day camps, and visiting nurses.
4. Relief for families of both early and advanced cases.
5. Sanatorial treatment for incipient cases.
6. Hospital care for moderate and advanced cases.

It is generally accepted that the registration and reporting of cases should be required by State law, and that the duty of reporting cases should be clearly imposed upon every practising physician, and the duty of securing the enforcement of the law should be imposed upon the local health officers of the villages, towns, and cities, under the general supervision of a State health department.

A dispensary or bureau for diagnosis is practicable in the small cities and large villages, and should be available to the surrounding rural communities. It is an agency that should be under local control, preferably that of the local health officer, and not under county control.

Home care is distinctly a local matter. Such adjuncts to home care as the supervision of the attending physician, or in his absence of the local health officer, the organization of classes, the establishment of day camps, are subjects for local control. So also is relief in their homes for families of cases.

The medical inspection of school-children, open-air schools, and school nurses are all preventive agencies for establishment and maintenance by the immediate local authorities, and not by the county as a county.

All that we have been considering thus far should be done in the county by the county subdivisions—that is, the cities, towns, and villages—and not by the county itself. Preferably, they should be established and main-

tained at public expense, but where this for one reason or another cannot be done, then the local committees of the cities, towns, and villages should undertake the work, but they should place the burden upon the public authorities as soon as possible. The prevention of tuberculosis is a public health problem, and should be financed at public expense. The public should carry the entire 100 per cent. of the load, and not let it be borne in whole or in part by the few.

What the county as a county should undertake is the providing of sanatorial treatment for incipient cases and hospital care for moderate and advanced cases. These may be readily combined in one plant or institution having a single administration building, pavilions for patients with moderate and advanced disease, and shacks or lean-tos for the incipient cases.

Such a hospital-sanatorium should be entirely separate from the almshouse and from almshouse administration. We must recognize and give way to what is at once a priceless possession, a prejudice, and an almost insuperable obstacle—the fierce opposition to accepting the shelter of an almshouse or the care of almshouse authorities. Nor should the patient be required to appear before the poor law authorities in order to secure admission. The sole test for admission should be—has the person tuberculosis? If so, admit him, and then empower the superintendent to ascertain his financial ability to pay. If he can pay in whole, he must do so. Otherwise he should pay according to his ability, and the county should make up the balance.

To keep the institution out of politics a non-partizan, non-salaried board of managers should be provided to conduct it. Some central authority, such as the State health department, should exercise supervisory control over the selection of a site and of plans, and should have the right of inspection of the conduct of the institution, so that its administration may be kept up to the mark.

If institutional custody is to mean institutional care, then no effort should be spared to keep the patients contented. The institution itself should be easy of access from the center of population, so that relatives and friends may, with a minimum expenditure of time, money, and effort, visit the patients from time to time. It is one thing to get tuberculosis patients to enter an institution; it is another thing to keep them there. A splendid opportunity is offered the unofficial community, through its various local committees, to supplement the efforts of the State authorities in their endeavor to place and maintain the administration of a county hospital-sanatorium on a high plane of efficiency.

The county as a county should also engage in rural nursing. Just as a

general hospital has a social service department, so should the county hospital-sanatorium have one or more social service nurses, the number depending, of course, upon the size and population of the county, whose duty it should be to popularize the institution throughout the county, especially in the rural districts, keeping all the beds filled, so that the institution may realize its maximum of usefulness to the community, and whose duty it should also be to follow up the discharged cases and assist them in securing suitable employment and living conditions to the end that a recurrence of the disease may not take place.

I feel that the county should also, as a general public health measure, establish a county laboratory where physicians may secure prompt bacteriological analyses of the sputum, blood, urine, and other excreta, of milk and water, and other substances. Most States and large cities have laboratories, but these are not used by the profession in the rural districts. County laboratories in New York State have encouraged and stimulated a larger use of bacteriological analysis upon the part of physicians generally.

Summing up, the points I would make are that the county and all its subdivisions should be organized officially and unofficially, in order to secure the necessary equipment—the proper preventive machinery; that the county as a unit by itself should have institutional nursing and laboratory provision; that the local subdivisions, such as the cities, towns, and villages, should provide what I regard as the purely local measures,—registration of cases, dispensaries, home treatment, and relief,—reserving to the State authorities adequate inspection and supervision over the entire county and local equipment.

THE CONTROL OF TUBERCULOSIS IN THE SMALLER TOWNS

By G. R. Pogue, M.D.
Greeley, Colo.

There is little difference in the control of tuberculosis whether the town be large or small, as the same factors are at work, in so far as the disease is concerned. In the smaller communities we are more familiar with the results of our work, in so far as each individual in the community is concerned.

The most notable phase of the subject is the apparent familiarity of the general public in regard to a knowledge of the disease, and the absolute confidence with which they give advice. This is characteristic both of the medical and of the lay population, and each individual considers his opinion to be the only correct one, even though they vary as the north from the south. This has been characteristic of the campaign against tuberculosis from the very beginning, with the result that 95 per cent. of the literature on the subject is of no value whatever except as an aid to creating phthisiophobia. Such a condition would not be tolerated for a moment in regard to any other disease.

How long would it have taken us to conquer yellow fever had we depended on the opinions of those who are ever willing to give opinions on disease? The efforts of societies, associations, and individuals would never have conquered the disease; but the scientific man dealing with *facts* soon gave us the required information, and the whole civilized world knows the results. The same might be said of cholera, bubonic plague, malaria, Malta fever, and cerebrospinal meningitis.

In all these cases we have scientific facts to guide us, not personal opinions.

We have numerous facts at hand in regard to tuberculosis, but we do not make the proper use of them. First, few individuals seem to be acquainted with them, and, secondly, we are too prone to be satisfied with opinions, and seldom ask on what authorities these opinions are based.

Here are a few facts that it would be well thoroughly to consider in regard to the control of tuberculosis:

1. Postmortems properly done on persons of thirty years and over dying of other diseases show that 100 per cent. have tubercular lesions, either active, quiescent, or obsolete.

2. E. Schmitz and others have been able to produce virulent tuberculosis in guinea-pigs from 75 per cent. of these old "healed" lesions.

3. Dunn's statistics in regard to tuberculosis in children coming to autopsy show the following figures: In the second to tenth year, 60 per cent. plus. In the tenth to fifteenth year, 64 to 77 per cent.

4. The work of von Pirquet and Hamburgher in Vienna shows that 97 per cent. of the children who reach the age of fifteen have tuberculosis. On these findings Hamburgher states that tuberculosis is as much a disease of childhood as measles or whooping-cough, and if the disease manifests itself later in life, it is not a new affection, but a lighting up of the old disease.

5. Römer and Joseph have shown, by a series of animal experiments, that animals suffering from chronic tuberculosis were wholly or in part protected against infection from without by tubercle bacilli, even when the dose was large enough to cause death in control animals that were previously free from tuberculosis. Here are some facts that may give us some light on the subject of reinfections, and may modify materially many of the "accepted opinions."

6. It is a fact that the mortality from tuberculosis has been reduced in the last decade, but what about the morbidity? From all reliable information at hand it would appear that the morbidity from tuberculosis is on the increase.

Following the work of Schmitz and Wegelin, we must conclude that a "healed" tubercular lesion does not mean a lesion free from virulent tubercle bacilli, and if virulent tubercle bacilli are present in 75 per cent. of the healed lesions, is it not natural to suppose that it is from the germs already in the system that we get our acute conditions instead of by reinfection from without. Here is where some scientific work should be done to give us more facts.

Why such general infection without a general morbidity and a higher mortality? It is not who will or will not get tuberculous infection, but who will or will not break down with the disease, and the question that we are called on to answer in regard to the control of the disease is, why do so many go through life with a latent infection, showing no signs of the disease, while a certain percentage regularly break down with the disease each year? What are the forces at work that control these two classes of individuals? I shall at present have to leave a full answer to that question to our scientific

investigators. I might, like many others, venture an opinion, yet that opinion might be far from the facts of the case.

With so many facts laid down in regard to infection in childhood and early life, the reduction of mortality by proper management of early cases, the continued percentage of morbidity in the face of all the good work that has been done, one would naturally conclude that we were attacking the enemy from the wrong quarter. There is no necessity of getting excited about infection when we consider the facts quoted above. If we are going to do anything to relieve humanity, it must be in regard to the control of the already infected. Add to this the facts brought out by laboratory workers, who have shown that even from old healed lesions 75 per cent. of inoculated experimental animals succumb to virulent tuberculosis. If we carry virulent bacilli with us in apparent health, again comes up the question, why the few break down and the many show no signs of infection. Again a question for our scientific men to answer by giving us facts, not opinions.

Let us just consider one phase of the subject with which most of you are more or less familiar. In many cities in the east and in Europe there have been established outdoor schools for children whose infection was extensive enough to be recognized. The results of such schools are familiar to all who are interested in this work. These children not only regained their health, but they also could do more and better work in a less number of hours than the children who attended the indoor schools, and from whose ranks the invalids were recruited. Now, if such a change from indoor to outdoor life did so much for those with recognized infection, what might not be done for those whose infection is so slight as to, so far, cause no suspicious symptoms?

I am not thoroughly enough acquainted with the system of ventilation in use in the various schools throughout the country to give any statistics on the subject. I do know that I have yet to see a school-room, with one exception, where the ventilation was sufficient for half a dozen persons, to say nothing of a room full of growing children who require a maximum of fresh air every minute of the day.

School-rooms are no worse than scores of other rooms, including churches, theaters, especially the numerous small cheap shows, public buildings, mercantile houses, and, most important of all, living rooms.

This is only one phase of the subject, and when figured out, means that lack of fresh air is one of the causes of lower vitality, or, as we put it today, a lowering of the natural immunity against disease. The many other factors that are active agents in lowering or destroying our natural immunity can-

not be considered here, but must be included in our campaign of education if we are going to succeed in conquering tuberculosis or any other disease.

There is nothing to be gained by continuing a campaign of education based on opinions or controlled by opinions. We must have facts to give to the public—facts that cannot be gainsaid or disputed.

We are all familiar with the fact that our farmers and stock-raisers are well versed in the subject of diseases of plants and animals, and how to control and prevent diseases of such.

These men did not gain their knowledge from articles contributed to popular magazines, advertising circulars, or booklets sent out by those who had some "cure all" to sell. They got their information from the bureau of animal and plant industry, conducted by the agricultural department of our federal government. These scientific men worked out the facts of the case. The government supplied those interested with these facts, and today our State agricultural colleges are spreading facts every day to those interested.

If we are going to deal in facts in our campaign of education, we must expect to get these facts from properly qualified scientific men, who can always be relied upon to leave the personal side of the subject in the background.

Under existing conditions there seems to be only one solution to this part of the problem. We must be able to go to our federal government with enough influence, not only to ask for, but to demand and receive, as much consideration from our government for the protection of our people from disease as is now granted to the agriculturists in regard to plants and animals.

A department of health, carried out on a purely scientific basis, with the work done by trained scientific men, would soon give us the facts we desire, and, moreover, such facts, coming from such a source, would carry greater weight with the laity.

I do not attempt to criticize the work that has been and is being done by our friends all over the civilized world, but I do see a great necessity of having facts to deal with in our campaign of education, so that we may gain the confidence of the whole public, and when we make a statement, have facts, not opinions, to back us up.

A STUDY OF THREE SMALL CITIES

By J. Byron Deacon
Philadelphia

The material used in this paper was derived from a series of investigations begun somewhat over a half year ago by a field worker of the Pennsylvania Society for the Prevention of Tuberculosis. The investigations were not made for the purpose of accumulating data for an exhaustive study respecting the conditions which contribute to the spread of tuberculosis, its extent, and what is being done in each locality for its cure and prevention. Our object was practical, rather than academic; nor was it necessary to our purpose that the investigations should be exhaustive, since what we aimed at primarily was to marshall a sufficiently accurate and general body of facts to serve as the basis of a practical working program for our local branch societies. In our experience a great obstacle to effective local work is the short and partial views of conditions and needs taken by local workers. It would, therefore, appear to be a distinct service, from the standpoint of the local worker, to have a comprehensive and, as it were, objective, outline of the local situation presented. Accurate knowledge of needs and conditions gives stimulus to local activity. From the standpoint of a State society a first-hand knowledge of conditions in constituent communities is necessary for intelligent direction of local work, and is, indeed, the only sound basis for an economical general educational and organization program.

Our method of investigation was as follows: (*a*) A field worker from the Pennsylvania Society for the Prevention of Tuberculosis examined the records of mortality from tuberculosis in the local health office, transcribing onto a card especially prepared for the purpose the name and address of decedent, and data respecting the age, sex, nationality, occupation, and social status. This information was tabulated for all tuberculosis deaths that had occurred in a period of ten years. In this way we were able to gage the extent of tuberculosis, the groups of the populace, and the section of the community especially affected by the disease, and also the relation of tuberculosis to other diseases as a cause of death. (*b*) We next referred to the official morbidity records, canvassed the private practitioners of the

community, and consulted the physician in charge of the local State Health Department Dispensary, to determine the number of living cases of tuberculosis in the community at the time of the investigation. (*c*) Our third step was an examination of local hospitals, municipal and private charitable institutions and organizations, and the local State Tuberculosis Dispensary, in order to learn what was being done for the relief and cure of consumption. (*d*) An investigation of districts of the city inhabited by wage-earners was next made, followed by—(*e*) an investigation of certain mills and factories, to determine respectively the conditions under which the laboring class live and work.

A brief report of the findings of our investigations in the cities of Allentown, Easton, and Williamsport will occupy the remainder of the paper. Allentown and Easton are situated in the eastern part of Pennsylvania, with populations of, respectively, 52,000 and 28,000; and Williamsport is in the northern central part of the State, with a population of 32,000. In the population of Allentown, Pennsylvania Dutch predominate; in Easton, German-Americans are in the majority, while native-born Americans form the bulk of Williamsport's inhabitants. The chief industries of Allentown are the manufacture of silk and cigars; in Easton there is a diversity of industry, including silk and hosiery mills, chemical, paint, and cement works, and on the outskirts of the city there are numerous slate quarries; the manufacture of silk and shoes is the chief industry of Williamsport. Each of these towns is a county-seat; in each there are one general hospital, one State Tuberculosis Dispensary, and a branch of the Pennsylvania Society for the Prevention of Tuberculosis.

Our examination of the mortality records in the health offices of these cities divulged the following facts: In Allentown there have been 616 deaths from tuberculosis in all forms during the ten-year period from 1900 to 1909 inclusive, or an average of 61.6 deaths per annum. The highest number of deaths for any one year during this period was 70; the lowest, 55. The death-rate at the beginning of the period was 1.66, and at the end, 1.33 per 1000. Of all deaths which occurred in the period studied, 0.086 were caused by some form of tuberculosis.

In Easton tuberculosis caused 361 deaths from the beginning of 1900 to the end of 1909. The highest number of deaths from tuberculosis in any one year of this period was 42, and the lowest 30. The death-rate at the beginning of the period studied was 1.50, and at the end, 1.31. The relative importance of tuberculosis as a cause of mortality in Easton during this period was as 0.077 is to 1.

Tuberculosis caused 361 deaths during this period in Williamsport. The greatest number of deaths in any single year was 44; the least number, 24. The death-rate in 1909 was 1.19. Of all deaths, 0.092 were caused by tuberculosis.

The death-rate from tuberculosis for the State of Pennsylvania for the last statistical year was 14.1 per 10,000, and the relative importance of tuberculosis as a cause of mortality, 0.093. It will, therefore, be seen that all three of these cities have a death-rate from tuberculosis lower than the rate which prevails for the State, and also that in each city the ratio of tuberculosis deaths to the total number of deaths was lower than for the State as a whole.

You will probably agree with me, after hearing this paper to an end, that in none of these three cities was there an anti-tuberculosis equipment or activity which would account to any appreciable extent for this decline, which has been erratic, rather than constant.

Turning now to a review of the agencies in Allentown, Easton, and Williamsport for the prevention, cure, and relief of tuberculosis, let us discuss, first, the strongest potential agency—the Board of Health. Since 1906 these cities, in common with all communities in Pennsylvania, have had power, through a State law, to require the registration of cases of tuberculosis. It is not singling out these three cities for invidious criticism to say that there appears to have been no effort made in any of them to enforce the registration law. I apprehend, where efforts to secure registration have been successful, there is always to be found a health officer who is a good deal of a diplomat and educator.

In the three cities we are discussing, the health officials are perhaps somewhat handicapped in the discharge of their public duties by being severally druggist, editor, and chief dispensary physician, in addition to holding the public health office. In Williamsport there is no record of the registration of tuberculosis for two years after the State law went into effect. The present health officer explained this by saying that his predecessor had not thought registration necessary. The explanation itself was scarcely necessary. From 1908 until the middle of August, 1910, the records show 91 entries of registration of tuberculosis. Allowing for duplications, these entries report 83 cases. Eleven private practitioners have reported 14 of the 83 cases registered; the remainder were reported either by the health officer himself or by the local tuberculosis dispensary. Set over against the 83 registered cases of tuberculosis the more than 150 cases which our investigator found actually under care, and the statement of the local health officer

that he is convinced that there are not less than 500 living cases in the city, and you have a commentary on the indifference to registration which prevails in these cities.

In Easton we found a total of 156 entries of registration since 1906. Of these cases, 80 were reported by physicians in private practice, and the balance through the local State tuberculosis dispensary. At the time of our investigation, however, we were able to discover 148 cases actually receiving care, or practically as many as had been reported in four years.

It is, of course, too trite to mention before this body that registration is in itself valueless, and needs sanitary machinery to make it effective; yet in none of these cities did the Board of Health offer to patient or physician any coöperative service in return for registration, unless, indeed, it were the disinfection of houses after the death of a patient; and from the report of our investigator this phase of the public health work would seem to be more honored in the breach than in the observance. Many of the disinfections performed had, in the opinion of our investigator, little or no preventive value, because inefficiently done. In none of these towns did the health board offer the physician facilities for the free examination of sputum, and in none was a nurse employed for the sanitary supervision of cases.

Allentown, Easton, and Williamsport have each a State Department of Health tuberculosis dispensary, maintained entirely by State appropriation. In Allentown the dispensary staff consists of a chief physician, two volunteer assistants, and a male visitor; in Easton there is a physician in charge, four assistants, and a trained nurse; in Williamsport there is a chief physician, one assistant, and two nurses. The Allentown dispensary is open two days a week for two hours each day. The Easton dispensary is open one hour a day three days a week, and the Williamsport dispensary is open five hours a day two days a week. The average daily attendance at the Allentown dispensary at the time of our investigation was 18; that of Easton was 15, while the Williamsport Dispensary had 221 cases under treatment. All the dispensaries distribute milk and prophylactic supplies to patients, and all are supposed to treat only indigent consumptives. In Allentown the young physician who acts as dispensary visitor is also a probation officer, and it scarcely needs demonstration that, under this arrangement, the home supervision of patients is not altogether what could be wished. Our investigator understands that when an attempt was made by this dispensary to secure a nurse, the request was refused on the ground that the appropriation would not admit of this additional expense.

The nurse of the Easton Dispensary, in speaking of the small number of

patients attending the dispensary at the time of our investigation, said that when the dispensary was first opened the impression among the poor was that the dispensary offered a "sure cure" for tuberculosis, and many had been attracted by this notion. Later, however, when the patients learned what the dispensary treatment was, and that little or no medicine was given, they drifted back to the "twenty-five-cent doctors." The fact that they were allowed to drift is perhaps the most illuminating commentary we can make upon the lack of aggressiveness which characterized the dispensaries in two of the cities investigated. In our opinion there appears to be an overweaning tendency to concentrate on the medical treatment of those who choose to report at the dispensary, rather than to expand the function of the dispensary to the large field of sanitary instruction and supervision in the home. The chief criticism which can be made against the dispensaries, the workings of which we have examined, is that their usefulness to the community appears to be exceedingly restricted on its social service side. This criticism, in its application to public medical agencies, is, I am sure you will agree, not limited to the State Health Department tuberculosis dispensaries of Pennsylvania.

What makes it especially important that tuberculosis dispensaries in small cities, such as we are discussing, should have skilful social workers is the fact that in such cities there is usually a great scarcity of charitable agencies. For instance, in Allentown the only agency for the home relief of the poor is the Poor Board, consisting of five members, appointed annually by the city council. In the year preceding our investigation this board spent $526.88 in poor relief. The only other private charitable agency in the city is a day nursery. In Williamsport there are a few church relief societies and a children's home, but no society from which relief for the families of the tuberculous poor can be obtained. Easton is rather better off in this respect, having a Charity Organization Society and several denominational societies, which do a considerable amount of relief work.

The greatest limitation in the tuberculosis equipment of these cities lies in the absence of any provision in them or adjacent for the institutional treatment of tuberculosis, whether in its early or in the advanced stage. Each of the cities has a general hospital, but to these hospitals only surgical cases of tuberculosis are admitted. The only other local agency is the county almshouse, and here, of course, the consideration which governs admittance is indigence, and not the existence of consumption. Our investigator inspected the almshouse in the county in which one of the cities under consideration is located. It was found that ambulant consumptives are en-

tirely free to mingle with the other inmates, and it was found also that this freedom included the privilege of using the common drinking-cup attached to the pump in the yard. If bedfast, the consumptive is committed to the care of the matron, assisted by a feeble-minded inmate. The medical attention is provided by a county physician who visits the home twice a week. There were seven consumptives in this almshouse during the year preceding our investigation. After the death of a tuberculous patient, the room is disinfected with sulphur.

Leaving out of consideration the institutional facilities at the command of well-to-do consumptives, what extra-mural tuberculosis institutions are there in Pennsylvania to which the tuberculous poor of our three cities may be sent? The answer will not be involved. There is but one such institution available—the State Sanatorium at Mont Alto, with a capacity of 756 beds, 180 of which are for advanced cases. In counting up the proportional claim of a particular community for admittance of suitable cases to this institution it must be remembered that each of the 115 State Health Department tuberculosis dispensaries is a recruiting station, and that the large cities of Philadelphia and Pittsburgh have also a claim upon the beds at Mont Alto. It is then small wonder that the physicians and nurses connected with the dispensaries in Allentown, Easton, and Williamsport are unanimous in reporting the difficulty of securing prompt admission—sometimes of securing admission at all—for their patients. Especial difficulty is found with respect to advanced cases, both because of the patient's disinclination to be removed to such a distance from home and also because of the pressure from all parts of the State for admission of such cases.

An exceedingly interesting phase of our investigations was the canvass made by our worker of the private practitioners in each community. In Williamsport there are 55 practising physicians. Of this number, our investigator succeeded in interviewing 34. These 34 physicians had then under treatment 56 cases of tuberculosis, 45 cases being pulmonary tuberculosis. In Easton we found 59 physicians and interviewed 40, 4 of whom were found not to be in active practice. Of the remaining 36, 14 stated that they were treating no cases of tuberculosis at the time of the inquiry, the remaining 22 were treating 137 cases, 97 of which were pulmonary tuberculosis.

In the judgment of our investigator most of the physicians interviewed manifested considerable interest in the problem of the care of the tuberculous poor. The majority of the physicians seemed to be convinced that the greatest need of their respective communities was for local institutional

provision for indigent advanced cases. Many of them, however, held what appears to us to be the mistaken view that this provision should be made in connection with the county almshouse.

It is unfortunate that there is not time to present at some length the report of our investigator respecting the conditions under which wage-earners in these three cities live. In Williamsport 160 families were visited in a house-to-house canvass; 18 suspected cases of tuberculosis were found and reported to the dispensary. It is the opinion of our investigator that in Williamsport there is no poverty comparable to that found in the larger cities, and that to a large extent the poor are the shiftless. Most of the houses visited appeared to have sufficient light and facilities for ventilation, were comfortably furnished, and occupied by only one family. In Williamsport and Easton the habitations of the wage-earners did not constitute a separate section of the community, but were scattered in various parts of the cities on streets adjacent to those occupied by the well-to-do.

In Allentown there appears to be a serious problem in the living conditions of a large number of young Hungarian girls employed in the cigar factories. Many of these girls live, sometimes as many as 20 or 30, in one house, each girl paying a dollar or so a month for sleeping privilege. These houses are rented or owned by individuals known as "bosses," who sublet the beds. The girl occupants are obliged to provide their own food. As the long hours and weariness incident to mill work leave little time and inclination for household duties, there is exceedingly little cooking done. Our investigator reports that the staples in such quarters are raw fruits and beer. In many of these houses the moral conditions are appalling, girls not infrequently falling prey to the "boss," who also resides in the house. It is reported that the birth of illegitimate children is a frequent occurrence. In some of these quarters beds are occupied by day and night shifts.

I shall make no attempt even to summarize the findings of our investigation of the industrial conditions in Allentown, Easton, and Williamsport further than to say that in our judgment the parsimony and indifference of employers and the ignorance of operators contribute in about equal measure to produce the bad sanitary conditions which prevail in a majority of the industrial establishments. It would seem that the standard of employers and superintendents should be raised, as well as that employees should be educated. In one cigar factory where sanitary conditions were in many respects of the worst, the investigator won the confidence of the superintendent and succeeded in engaging him freely in conversation. It appeared that this man has only one standard of a clean factory, and that is clean

floors. He lived up to this standard, and took evident pride in the cleanliness of his floors, yet the ventilation and toilets of this factory were thoroughly bad. Improving the conditions in this instance would be largely a matter of raising this one man's standard.

Raising the standard does not mean simply telling the responsible people what constitutes right conditions, as was conclusively proved by the investigator's experience in another cigar factory. A survey of the building from the outside showed every window to be tightly closed, yet when the investigator gained admittance to the working-rooms, each window was down a little from the top and up the rest of the way from the bottom, affording ventilation of an approved kind, and showing that the superintendent understood something of the standard set by anti-tuberculosis workers, but had not made it his standard.

In Easton no small number of employers were found who expressed willingness to have noon-time lectures on tuberculosis given to their employees. In several instances the employers offered to defray the expense of such lectures, and one employer volunteered to allow the lectures to be given in factory hours.

And now to conclude this study, which has not been a study at all, but merely a glance at the conditions in three cities from the viewpoint of determining their tuberculosis needs—what shall we say these needs chiefly are? The facts we have marshalled, scanty though they are, will perhaps support the conclusions: first, that the primary and immediate need in all three cities is for adequate hospital provision, readily accessible, and with the loud pedal, so to speak, on provision for segregating advanced cases; second, for the operation, at maximum efficiency, of the machinery which already exists in the State health department tuberculosis dispensaries, for the home supervision of consumptives, and the extension of this machinery, through the employment of nurses, preferably by the local health boards. Probably one nurse in each city would be sufficient. And, finally, to bring all this to pass, an intelligently directed, vigorous, and continuous educational effort is needed.

REPORT ON TRAVELING TUBERCULOSIS CAR OF MISSOURI ASSOCIATION FOR THE RELIEF AND CONTROL OF TUBERCULOSIS

By Miss Winifred Doyle
St. Louis

The Missouri Association for the Relief and Control of Tuberculosis was organized in 1907. Its work has been along three lines—organization of local societies, education of the public, and securing legislation for the prevention of tuberculosis.

So far as the limited means of the association allowed, the local organization was carried out through the local medical, social, and business organizations, the medical societies being naturally the leaders in such movements. The result was that a number of societies were formed in several cities and counties.

Few can realize the great difficulties encountered in a work of this kind, which must depend for its success on voluntary subscription. The larger cities of the State need all that can be secured for their own work, while the smaller cities give no help at all.

It was found, therefore, that these smaller societies after a time began to lose interest and became listless. In casting about for a means to revive them, it was suggested that a well-chosen exhibit, placed on a railway car and carried about the different towns in Missouri, would be an effective way of educating the public as to how tuberculosis is communicated, prevented, and cured. Accordingly, early in 1908 the State Board of Health was approached with a plan and coöperation suggested. Objections were raised, and the plan was dropped.

The idea of the car campaign was undertaken for two reasons: First, to disseminate facts about tuberculosis and its prevention; next, to awaken public interest in the measures for its elimination, which measures were submitted to the last General Assembly of the State.

And the idea was not lost sight of. The association at once tried to raise funds for a traveling tuberculosis exhibit. This hope was realized

when it was announced that a check was in hand sufficient to cover for a time the expense of the work planned. This announcement was made at the section on Preventive Medical and Public Hygiene during the annual meeting of the American Medical Association, held in St. Louis last June. I then approached the managers of various railway lines operating in Missouri, asking that the railroads donate a car and help in the work. The result was that the St. Louis and San Francisco Railroad through Mr. C. R. Grey, second vice-president, and Mr. Alex Hilton, general passenger agent, offered to lend a first-class day coach in which to carry an exhibit about the State.

According to the plans of Mr. J. Hal. Lynch, treasurer of the association, the seats were removed from the car at Springfield, and the car was fitted up by special decorators for hanging and lighting, to be ready for the exhibit.

In fitting up the car the space was utilized to the utmost by the device of a partition lengthwise in the center formed of framed pictures hung back to back. The end and side walls were also fully utilized, and on shelves and in lockers an ample supply of literature, buttons, post-cards, sanitary folding cups, etc., was to be found.

The Frisco Railroad gave free transportation to five people connected with the work, and furnished free ice and gas for the trip. A time schedule was made out, by which 38 principal towns on the Frisco in Missouri, and 28 counties were reached, a distance of nearly 2000 miles being covered.

The St. Louis Municipal Commission, with generous spirit, offered the use of its well-framed exhibit for the work, and this was found admirably adapted for the purpose. This excellent assistance was gratefully acknowledged.

Dr. James Stewart, medical advisor for the Board of Education in St. Louis, offered his services free as lecturer during the tour. Dr. Stewart was furnished with a paid assistant, who operated the stereopticon for the evening lecture and looked after the property in the car.

It was further arranged that the secretary should travel from five to seven days in advance of the car, making all the necessary arrangements with the local boards of health, physicians, city officials, business men, and club women for the exhibit, cards being regularly mailed ahead showing what was desired of her.

The car left St. Louis August 1st, visiting the towns along the Mississippi as far south as Caruthersville, through the southern part of the State to Springfield, then through the lead and zinc mining districts to Kansas City. In Kansas City the exhibit was taken from the car and placed in Convention

Hall, where it remained for two days. A young lady in Kansas City, a former patient of Mt. Vernon Sanatorium, gave her services as part of the exhibit in setting forth the good effects of the State's work.

From Kansas City the car visited towns on the way to Springfield. Dr. Hermann Pearse, president of the State Medical Association, lectured on the trip to Springfield. From Springfield the car visited the towns on trunk lines to St. Louis, the schedule having been lengthened, owing to a popular demand for a longer stay in towns. Dr. Solon Cameron, of St. Louis, now a member of the executive committee State Association, lectured the last week of the tour in Frisco. On the arrival of car bombs were exploded. These were the signals for bells to ring, whistles to blow, and citizens to meet the car. The car was always met by the mayor and committee of citizens.

It was made an object at the time to meet the members of the legislature and explain the work, so that they might give support in matters pertaining to the work which may be presented to the next legislature. Large and interested audiences greeted the car at the towns where the exhibit was shown. Indeed, it may be claimed with justice that, for a venture which, so far as known, stands unique in its character as a pioneer effort, the undertaking was a conspicuous success, large and interested gatherings being the rule.

After remaining in St. Louis a week the car was taken out over the Missouri, Kansas and Texas Railroad, Mr. A. A. Allen, president of the M. K. and T. and Mr. A. Durham, General Manager, according every assistance the railroad could give.

About 29 towns in south Missouri were visited. In several towns the car was welcomed by a band and the greatest enthusiasm shown. Booneville, Mo., was especially hospitable and interested in the work, the mayor and club women giving us great encouragement.

After finishing the towns on the M. K. and T. the car was taken to the State Fair at Sedalia, where part of the exhibit was placed in the west end of the Art Building, the remaining part being left in the car. Hundreds of visitors saw both exhibits.

Governor Hadley consented to accept the presidency of the association this year, and showed further his keen interest in health matters by appointing a temporary commission to investigate tuberculosis conditions in Missouri, with a view of submitting a bill to the legislature providing remedial action.

Dr. George Homan has written an article on the special exhibit car for the Journal of the American Medical Association, from which I wish to

quote: "As before indicated, much of the best help and coöperation at the different points visited was given by the organized medical profession, officials of local societies, councilors, and the President of the State Association, all lending a hand, with full sympathy and good will, to forward the cause. A number of leading physicians along the route even volunteered their services for work with the car if future tours were found possible. Another factor making for the success achieved was the public press, many of the papers giving columns of space to descriptions, with pictures, etc., showing the work and purposes of the car."

"While it was found that a considerable financial outlay is involved in the operation of such a traveling exhibit, even when much necessary service is rendered free of charge, still it is firmly believed that the returns to the public in the form of a better knowledge of disease prevention fully repays such expenditures, and it is the hope of the association that additional financial means will be forthcoming to enable this form of instruction to be pushed into every part of the State where the railroads penetrate. Thus far, practically, the whole burden of this work has been borne in St. Louis, and the available funds of the Association have been exhausted in the enterprise herein sketched."

The Association introduced a bill in the 1909 session of the General Assembly of Missouri providing for the appointment of a State Tuberculosis Commission for investigation and education, but this bill was not reported out of committee.

The Association also introduced a bill providing for the treating of tuberculosis in the public schools, which was passed.

The appropriation bill for the Mt. Vernon Sanatorium, the Vital Statistics Bill, the amendment providing for the eradication of tuberculosis in cattle and other measures, received the support of the Missouri association.

The Tuberculosis Congress of 1908 recommended the cure of consumptives as a measure of prevention, and all the commissions on the subject made similar recommendations.

The temporary commission appointed by the Governor of Missouri last year to investigate the prevalence of tuberculosis in the State therefore recommended to the General Assembly the organization of the counties of the State into 25 tuberculosis hospital districts, and the passage of a bill enabling counties to build these hospitals. This bill was passed.

The State Association is now endeavoring to induce counties to issue bonds and build these hospitals.

Considerable time will necessarily elapse before dispensaries will be

established in towns of 4000 population or over, and even when such dispensaries exist, there will be a large number of the people without any opportunity for free examination.

During the trips of the tuberculosis exhibit car many people traveled to the car across miles of country, believing that they could secure examination and advice from the physicians in charge. The experience has led to the belief that a railway car fitted up as a dispensary and in charge of an expert physician, sent throughout the State into every town and village on a railroad line, would be of incalculable benefit, first, to local physicians in aiding in diagnosis, and, second, to the people in providing for free examination and advice.

This association has, therefore, suggested that the State Board of Health be authorized to equip a traveling diagnosis car and be given the necessary appropriation for the car and its equipment and maintenance.

CLINICAL SECTION

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BOSTON'S HOSPITAL SCHOOL FOR TUBERCULOUS CHILDREN

By Edwin A. Locke, M.D., and Timothy J. Murphy, M.D.
Boston

One of the most important developments of the tuberculosis campaign in recent years has been the demonstration of the prevalence of pulmonary tuberculosis among children at the school age, and of the direct relationship of infection to conditions of general debility in the child. Every well-organized program of anti-tuberculosis work should give prominence to efforts especially directed against the disease at this age period. Unquestionably, the most important measure adopted to meet the needs in this field is the outdoor school.

So generally are these principles accepted that it would be superfluous to discuss them in this paper. We start with the assumption that all will admit the necessity of the maintenance of such institutions for the care of tuberculous children, at least in every large community.

The hospital school conducted in Boston during the past two years is one of the most important of the experiments in this new field of tuberculosis work yet made, and it is hoped that a discussion of our experience in this undertaking may prove of interest.

HISTORY

In July, 1908, the Boston Association for the Relief and Control of Tuberculosis opened, on Parker Hill, a day camp for tuberculous children. While primarily for those actually tuberculous, a certain number of debilitated children who were exposed to the disease at home were also admitted. The children were kept in the open air for the entire day, and were always under a definite program, including the care of gardens, housework, play, rest, talks on health, and nature studies. The success of the undertaking during the first two months led the Association to seek the coöperation of the Boston School Board in changing the day camp to an outdoor

school. This coöperation on the part of the school board was readily given, and the school was opened in September of 1908. The onset of cold weather, together with the increase in numbers, necessitated a change to larger and more permanent quarters, and, through the generosity of the park commissioners, the school was installed in the Refectory Building in Franklin Park. The roof-garden was equipped with canvas curtains, to be used in case of storm or high winds, desks, chairs, etc., and converted into a schoolroom. Here the children remained during the day throughout the entire winter, in spite of the hardest storms and coldest weather.*

The first winter of this undertaking was marked by such striking success as to call forth general approbation, and to be considered as amply justifying the demands for further development. The work was transformed to the joint control of the Boston Consumptives' Hospital and the Boston school departments, October 12, 1909. Since that date until its close, January 31, 1911, the institution has formed a part of the Boston Consumptives' Hospital, and it is to the work of this period that we especially invite your attention.

EQUIPMENT AND ORGANIZATION

The Refectory Building was admirably adapted to the needs of a hospital school. On the spacious roof a large outdoor schoolroom was fitted up, and except for short intervals during the day, when the children went inside for meals, baths, examination, etc., was the place where they spent the entire day, whether studying, resting, or playing. All the strictly school equipment was provided by the Boston school department, the remainder, by the Consumptives' Hospital. Various rooms in the building were adapted to the needs of the nurses, teachers, and others. On the ground floor were located the kitchens, dining-rooms, baths, coat-rooms, and toilets.

Although the hospital school was maintained jointly by the two departments above mentioned, the institution was regarded strictly as a hospital or day camp, and formed an integral part of the Boston Consumptives' Hospital. As such it was administered by the superintendent of the hospital, and the medical duties were performed by the medical staff. The immense advantage of such an arrangement is at once apparent. Records of all kinds used were uniform with, and formed a part of, those at the out-

*An excellent account of the work of the school to January, 1909, was published by Dr. James J. Minot and Miss Hyams, of Boston, in the Fifth Annual Report of this Association.

patient department, and were returned to the files there after the discharge of the child. All teachers were furnished by the school department, and held to the same requirements regarding general work as in the ordinary public schools. The children, however, were regarded strictly as sick children, and their entire life in the school regulated in accordance with orders of the visiting physician.

At entrance each child was assigned a number and provided with a reclining chair, blankets, thick overcoat, paraffined canvas bag with a detachable blanket lining in which to sit or recline, woolen cap, mittens, overshoes, individual drinking-cup, and tooth-brush, all of which were numbered.

The cases admitted came largely from the out-patient department, although, to some small degree, directly from the public schools or private physicians. By arrangement with the school nurses all debilitated, anemic, or undeveloped children were singled out, examined by the school physicians, and all positive or suspected cases referred by them to the out-patient department for diagnosis. Many children from tuberculous families were also sent for examination by the nurses of the department. Other agencies have coöperated in making this dispensary the center for this special work. In consequence, the children admitted to the hospital school were referred from this source, although a few were accepted on the recommendation of their family physician.

The school was kept open on Saturdays and holidays, experience having demonstrated the bad results of repeated regular absence from the routine of treatment.

The Boston Board of Health gave the school every possible assistance, and by special arrangement all specimens of sputum and throat cultures were examined in the city laboratory. A specimen of sputum from every child, so far as it could be obtained, was sent to the laboratory, and, if negative, the examination repeated at weekly intervals. In all, sputum was obtained from but 38 children. Tubercle bacilli were found in nine. A culture was made as a routine of all cases of sore throat, and the child isolated at home, under the care of the visiting nurses, until the report of the examination was known. Likewise, all cases in any way suspicious of the acute exanthemata were sent home and kept under observation until the condition could be safely regarded as non-contagious. In spite of the fact that during the course of the last year several cases of contagious diseases appeared among the children, these rules were so carefully carried out that no case of contagion occurred. The nurse was furnished with written instructions covering all possible emergencies. One of the visiting physicians

was always on telephone call, and every medical question of importance referred to him.

Three physicians were regularly in attendance, as a rule, at least four visits each week being made. Once each month every child was given a complete physical examination. The daily observation regarding the condition of the children was left to the nurse.

Those cases needing examination of the nose, throat, or ears were referred to the out-patient department. A considerable number had tonsils and adenoids removed. Those with teeth needing care were systematically sent to their own dentist if they had one, or, if not, were taken by the nurse to the Harvard Dental School for treatment. Other special conditions were treated in special clinics.

To place the child under ideal hygienic conditions during the day and allow him to return to bad home conditions at night is obviously ineffective. Every effort was, therefore, made to investigate the homes and to improve the conditions, so far as possible, when unfavorable. To some extent this was done by the visiting nurses from the out-patient department, but chiefly by a trained social worker who gave all her time to the home work. She devoted her efforts particularly to the improvement of the conditions in the sleeping-rooms and to the selection of a diet suitable to the child. The results in this field have, we believe, been most gratifying.

The entire staff of the institution comprised three physicians, a nurse, social worker, dietitian, five teachers, a cook, two maids, and a janitor.

We wish especially to emphasize the fact that the hospital school was, in the strictest sense, a hospital, organized and administered as such. It was not maintained for the "debilitated" or "anemic" child, but for the tuberculous only. The child was always referred to the superintendent for admission, as in any hospital, and discharged by him according to the patient's condition as given by the visiting physician. The doctor was in command, laying down not only the rules for the general course of treatment, but usually for the individual in particular. The prime object of the hospital school was not so much to remove tuberculous children, dangerous to others, from the public schools, as to cure them and to make them healthy adults. To this end lessons were regulated entirely with regard to their physical condition, the nurse, in the absence of the physician, being the sole judge of the amount and type of instruction indicated. Competition in studies was never stimulated by the teachers unless the condition of the patients admitted, and there was no pressure of work for advancement, as in the ordinary public schools.

PROGRAM

At entrance the physical condition of the child was determined by one of the visiting physicians, and, depending on this, he was placed in one of three groups. The daily program for each of these groups was arranged with reference to the amount and nature of the study, exercise, and work. Those in Group I were required to follow the regular routine of the school, which included a systematic assignment of work, exercise, and study. In Group III no work and a minimum of study and exercise were permitted. Group II was intermediate. Individual exceptions were, of course, frequently made. Absolute rest in the case of those with active tuberculosis was less rigidly enforced than would be considered wise in the treatment of adults. We have felt that the child should not necessarily be active, but should be occupied.

Work of various kinds under supervision was arranged and graded, so far as possible, to suit the ages and fitness of children to perform it. In small groups the available children were assigned for each week to a schedule of duties. These consisted in setting and clearing the tables, washing dishes, sterilizing the eating utensils, dusting, assisting the nurse, watering the flowers, and other such occupations.

On their arrival, at 8.15 o'clock, the children first washed their hands and prepared for breakfast, which was served at 8.30. At 9 all the children were required to go to the wash-room to brush their teeth. Those not assigned to work then went to the open-air room on the roof, where they were given breathing exercises and school work, according to their condition. A few of the sicker patients remained in their steamer-chairs for the greater part of the time. During the cold weather the school routine was frequently interrupted by short periods of light exercise. From 11.30 to 12 games were allowed. At noon school work ceased, and the children prepared the roof for the rest hour. They then filed to the wash-room to prepare for dinner at 12.30. Following dinner the teeth were brushed, and all basins and other utensils used in the wash-room packed in the sterilizers. By 1.30 they were again in their places on the roof, where they rested in steamer-chairs until 3. In the winter the children were kept warm during this period of rest by sleeping-bags and blankets. At the close of the rest period exercises, singing, talks by nurses or teachers, and similar exercises occupied the time until 3.30, when the temperatures were taken and the chairs put away. By 4 they had again finished with the same preparations for the table and sat down to supper. Beginning at 4.30 they were dismissed in small groups,

a teacher accompanying them as far as the Dudley Street Transfer Station.

On Saturdays and holidays and during the summer the teachers not being present, the work of the school was considerably changed. Volunteer workers took the children for walks, supervised them in games, and gave them talks on nature or hygiene topics.

The children were not allowed to use ordinary handkerchiefs while at school, but were furnished with paper napkins instead, which, after being used, were placed in paper bags, and at the end of each day burned in the furnace.

DIETS

Investigation of a considerable proportion of the homes of the children showed that over 50 per cent. had received charitable aid of some sort, and in a majority of these homes a proper and adequate diet was not given the child. In many instances, however, it should be stated that the family seemed able to provide a suitable diet, but through ignorance or neglect did not. Our social worker, therefore, devoted much time to instructing the mothers as to the needs of the child and the best methods of preparing the food. In the treatment of children with tuberculosis the first essential is the provision of an adequate diet, for we must not only meet the need for increased resistance to combat the disease, but also for a relatively large amount of nourishment, to answer the demands of a growing organism. Open-air treatment without attention to adequate feeding may be a positive detriment, since, by increasing the demands for heat, the fuel requirements of the organism are materially increased.

In the work of the hospital school the closest attention was given to the question of nutrition. At intervals the children brought lists of the food eaten at home for a period of several days, and, in the diet prescribed, every effort was made to supplement this diet in such a way as to provide a total suited to the particular needs of the individual child. So far as possible the food served was of the kind which can be provided by the families of the class from which the patients were drawn. A minimum cost was also a determining factor in its selection. This department was entirely in the hands of an expert dietitian, who devoted her entire time to the work. Throughout the year experiments were carried out on selected groups of children, to determine the diet best adapted to their needs. Every serving in such cases was carefully weighed, its caloric value reckoned, and the results tabulated. The results were tested by the course of the weight curve

and observation of the general symptoms. The diet, for example, furnished to a group of 35 boys and girls of average age—thirteen—and average weight —66 pounds—during a test period of two months gave the following: Protein, 114 grams; carbohydrates, 394 grams; fat, 113 grams. The fuel value of this diet was approximately 3100 heat units, or 100 calories per kilo of weight. In general, this is much higher than the standards ordinarily accepted as necessary for children of this age, but it must be remembered that the test was made during the winter months, when, in spite of warm clothing, the heat radiation is considerably increased; that the children were in the open air for the entire day; and that the amount of muscular work done was probably somewhat above the average. No inconvenience whatever resulted from the large amount of protein ingested, and the diet in every way appeared to be admirably suited to the children. The following varieties of foods made up the bulk of the diet: Milk, butter, bread, crackers, dried fruits, cocoa, rice, cereals, jams, simple puddings, soups, meats, and vegetables. The following ménu, calculated with reference to the calories furnished, is given as an illustration of the average diet:

BREAKFAST

Cocoa. Graham gems and butter. Stewed prunes.

LUNCHEON

Baked beans and brown bread. Milk. Apple or orange.

SUPPER

Milk. Bread with jelly.

	AMOUNT.	PROTEIN.	FAT.	CARBOHYDRATES.	CALORIES.
	Grams.	Grams.	Grams.	Grams.	Grams.
Cocoa (2 cups)	510	19.07	23.42	37.86	451
Graham gems (2)	57	5.07	1.03	29.70	152
Butter	28	0.28	23.80	....	223
Stewed prunes	28 (dry)	0.59	....	20.50	87
Baked beans	91	6.28	2.28	17.84	120
Brown bread	241	13.01	4.34	113.51	559
Apple	113	0.34	0.34	12.20	55
Milk (3 glasses)	755	24.92	30.20	37.75	538
Bread	57	5.19	0.91	30.38	154
Jelly	19	0.20	....	14.74	61
Totals	1899	74.95	86.32	314.50	2400

During the first ten months of the year 1910, with an average attendance of 64.25, the average cost of raw food materials per child per day was $13\frac{1}{5}$ cents.

BATHS

One of the most important features of the work in the hospital school was, we believe, the system of bathing carried out. A portion of the large room in the basement of the refectory was fully equipped with shower-baths, sinks, racks, etc., and used for a wash-room. Each child was supplied with an individual basin, soap, tooth-brush, mug, and comb, all of which, as in the case of the blankets and other articles mentioned above, were marked with the registration number. For the proper care of these the patients were held strictly responsible. Once each week, with few exceptions, every member of the group of children was required to take a shower-bath, the teachers usually assisting the nurse in the work of supervision. Paper napkins were used in the place of hand-towels, and tooth-picks for nail-cleaners. After being used, both were burned in the furnaces.

COST

The first cost of equipment was as follows:

Blankets, clothing, etc.	$1,208.21
Household, kitchen, and dining-room supplies, hardware, and equipment	1,065.51
Furniture and furnishings	357.75
Repairs	158.97
Electric fixtures	50.33
Plumbing	43.96
Medical equipment	14.66
Total capital expenses for school	$2,899.39

For the year 1910–11 the total general operating expenses were $8,231.60, or a cost, per patient per day, of 56 cents. This is exclusive of the school proportion of the general hospital administrative expenses estimated as $1277.34, which, if added, brings the per capita cost per day to 65 cents.

It should be clearly understood that the term "general operating expenses" covers many items not ordinarily included in the cost of such an institution. During the year 12 adults besides the children were furnished regular meals.

RESULTS

Considering the relatively short period covering the existence of the hospital school, exact figures of the results are of questionable value. Every one at all familiar with tuberculosis in children realizes the uncertainty of diagnosis in many instances, and the difficulties in determining the results of treatment. It is, furthermore, impossible to give any precise account of the influence of such an organized effort in other ways than directly on the physical condition of the individual. The favorable influence on the conditions in the homes has frequently been noted by the nurses and social worker. Opposition on the part of the parents to any of the methods employed at the school have been the rarest exception, and in most instances we have received their hearty coöperation and approval. The demonstration of the fact that tuberculous children can be treated in the open air during the cold and stormy winter months without discomfort to the child and with enormous physical benefits has proved a great object-lesson to the community. To this school and the public interest which it has aroused is, it seems fair to state, due the general movement in Boston for open-air rooms in all school-buildings. Far more attention is of late given to the ventilation of school-rooms, as well as to the physical condition of the school-child.

The general results of treatment have, on the whole, been extraordinarily satisfactory. After admission the children show, almost without exception, an immediate improvement in their physical condition in response to the life in the open air, rest, and feeding, and the teachers have frequently noted a striking development in the mental powers also As a rule, they enter into the routine of the school with enthusiasm, and we have never observed any hardship from the life in the open air, even during the most severe winter weather. On several occasions, when discharged, the child begged to be allowed to remain.

From October 12, 1909, when the hospital school was taken over by the Boston Consumptives' Hospital, until its close, January 31, 1911, a total of 191 children—94 boys and 97 girls—were treated. One hundred and seventy-four of these were treated during the year ending January 31, 1911.

The following table gives the grouping of the 191 children according to age and sex:

Ages.	Boys.	Girls.	Totals.
4 years	..	1	1
5 "	1	3	4
6 "	6	3	9
7 "	4	5	9
8 "	9	7	16
9 "	9	8	17
10 "	16	12	28
11 "	16	12	28
12 "	12	12	24
13 "	9	13	22
14 "	7	16	23
15 "	2	4	6
16 "	3	1	4
Totals	94	97	191

The condition at entrance is given below:

Stage at Onset.	Boys.	Girls.	Totals.
Suspected	4	1	5
Stage I	61	66	127
Stage II	24	21	45
Stage III	3	9	12
Tuberculous glands	1	..	1
Unknown	1	..	1
Totals	94	97	191

It will be seen that the patients classed as Stage I comprise 66 per cent., those as Stage II, 24 per cent., and those as Stage III, 6 per cent., of the total.

Tabulation of the 184 cases comprising those actually tuberculous according to the results of treatment shows the following:

	Arrested.	Improved.	Un-improved.	Unknown.	Non-tuberculous.	Totals.
Stage I	51	53	8	11	4	127
Stage II	13	23	7	1	1	45
Stage III	..	6	5	1	..	12
Totals	64	82	20	13	5	184

These figures cannot be accepted, however, as truly representing the success of the treatment given, since no account is taken of the length of stay, regularity of attendance, unfavorable home conditions, and many other factors which manifestly exert an important influence on the effectiveness of treatment. Furthermore, the term "arrested" has been employed in a very restricted sense. Several, at least, of the improved might have been included in this group, but were under observation too short a

time to warrant the use of the term "arrested." The "unimproved" were chiefly of two groups—first, those who were too sick to be at the school, having been admitted because no place in a hospital could be provided for them; and, second, those who attended for only a short period, or very irregularly. The closing of the school further made it necessary to discharge all patients, irrespective of their conditions. About 100 were registered at the school just before its closing. Taking these facts into consideration, therefore, the results seem to us extremely satisfactory.

The response to treatment is well indicated by the table of gains and losses in weight for the entire group of 191 patients:

Weight.	
Number gaining	147
Number stationary	16
Number lost	17
Unknown	11
Total	191

The 33 cases who either remained stationary or lost weight were made up very largely of those whose attendance was very irregular, or whose home conditions were bad. Many belonged to the second and third stage of the disease. The largest gain in weight was 27¾ pounds. Gains of 8 to 12 pounds were not infrequent.

Recently an attempt has been made to learn the present disposition of the 174 cases treated during the past year. One hundred and fifty-six were found, and the record is given in the following table:

Condition at Discharge.	Stage at Entrance.	Public Schools.	Left the City.	Working.	At Home.	Day Camp, Hospitals, Etc.	Dead.	Totals.
Arrested	I	34	8	1	1	..	..	44
	II	9	2	..	..	1	..	12
	III	..	..	..	..	..	..	..
Improved	I	36	5	3	4	5	..	53
	II	9	..	3	3	6	..	21
	III	1	..	..	3	1	1	6
Unimproved	I	2	..	..	4	3	1	10
	II	..	1	..	1	2	2	6
	III	..	..	..	3	1	..	4
Totals	..	91	16	7	19	19	4	156

DISCUSSION ON PAPER BY DRS. LOCKE AND MURPHY

Dr. William Charles White, Pittsburgh: I feel that Dr. Locke has brought before the Association one of the basal factors in the campaign of tuberculosis work in the future. As Dr. Welch pointed out so clearly this morning, I believe that until we get to the problem in childhood we are probably skimming the surface and taking a constant stream of consumptives who will be pouring into our coffers for many years to come. I would suggest that we go a step further in the care of the children, that is, go back of the children that are definitely consumptive, and urge that each organization—especially does this apply today to the charity organizations working along this line—makes it one of the strongest platforms in its campaign to urge school boards to establish in their schools, not the picturesque open-air school, which is too much of a change or a revolution for our present condition, but open-air rooms in which the poorer children can be put, and that this be urged as a part of municipal management of children. We have children under our control in municipalities, in counties, and country districts for a large part of the day, and I feel that with medical inspection we should be able to segregate children that are not immune, or whose immunity has not been built up far enough to resist the tuberculous infection which they seem bound to receive into their bodies. It would seem to be a positive fact that children are bound to get tuberculosis in some form at some time during the first fourteen years of their existence, and especially does this apply to the children that are in the poorer districts in our municipalities and in our counties, and, I am sure, that if we take the attitude of endeavoring to establish immunity in children by paternal or socialistic feeding, if we take the paternal attitude of feeding the children properly, we will accomplish much good, because we know that the vast majority of those children in the poor districts, going to the school, do not have enough food in their bodies to carry them even with a minimum of comfort through the day, let alone a comfortable feeling which will enable them to take up and digest the studies which we pour into them. If we could carry farther our paternalism, which is the key-note of modern State and municipal government, we would be farther ahead with the tuberculosis movement than we will be if we neglect this feature, and, taking into account our loss from tuberculosis, it would be a comparatively cheap investment to carry out Dr. Locke's scheme of establishing open-air schools—getting away from the picturesqueness of it. It would be a good thing if we could carry it back into municipal control, with the idea of better equipment in our schools for the care of the poorer children and the addition of the canteen for school-children.

Dr. Edward von Adelung, Oakland: It might be interesting to the members of the Association to know that in Oakland, California, we have carried on some experiments on a smaller scale, and somewhat differently from those which have been mentioned in this excellent paper, inasmuch as the children which were experimented on were not known to be tuberculous. They were selected from one of the grammar schools because of being backward, and segregated in the same school-yard in a wooden open-air building. The observations were carried on for one school term only. The children were not in any wise controlled differently from the children left in the old school-building other than that they had fresh air in the rooms, the rooms being built so that they could not be closed to the open air entirely, with no change in feeding or clothing, and no change in studies or hours. Yet in this short time the statistics showed clearly that these children were materially benefited. The weights of these children were compared with the weights of the children left in the old school, and they showed a gain of 50 per cent. larger than the gain of the children in the main school.

These observations lead us one step farther back than the last speaker suggested, namely, that we place not only tuberculous children in special open-air schools, the anemic, and those that are failing in physical health, but that we give all children the benefit of open-air schools. We should *preserve* their health instead of trying to *mend* it after it is lost. I am strongly in favor of this. At the same time I recognize the fact that the innovator must be slow. And so I indorse heartily the paper of Dr. Locke, and the remarks of the gentleman who preceded me, in endeavoring to get schools built with one or more rooms of the open-air type, but our object finally should be to get all the school-rooms so arranged that the children cannot be supplied with impure air. In the city from which I come the schools have been provided with the best scientific mechanical ventilating systems that can be found. No money was spared to secure this, and when I say the "best scientific ventilation" systems, God save the mark! because the rooms were very poorly ventilated. Ventilation is a branch of science which is as yet in its infancy, and I believe that, in the present state of our mechanical devices, we would do well to go back to natural ventilation.

Dr. R. S. Towne, Omaha: I would like to say that, until we can get the rooms asked for in school-buildings, I think it would be a good idea to do as the superintendent of schools of Chicago has ordered done, namely, to open the rooms two or three times each session and thoroughly air them.

THE PRESENT ATTITUDE TOWARD CLIMATE

By Alexius M. Forster, M.D.
Colorado Springs

My chief object in taking up the subject of "climate and altitude" was to learn whether or not there was any unanimity among the authorities in regard to the question. It was my opinion that there was a great variety of views. I have written to a number of leading men in different parts of the country, and they have most generously responded. I cannot help feeling that if Bernard Shaw had chosen this subject around which to weave the plot of "The Doctor's Dilemma," he would have been able to write a far more brilliant satire than he did.

Some years ago a committee of this Association considered the subject and made a most fair and comprehensive report. In spite of the reasonableness and soundness of their conclusions, there still seem to be many very able men who differ seriously from them—in fact, I know of no other question in medicine which seems so much in dispute. Those holding negative views have dealt very gently with me in their letters, and yet there is an underlying current of deep conviction that would almost remind one of the early days of religious dispute.

While in the East, I shared in the view that the advocates of climate were a bigoted and fanatic lot, and that their claims were overdrawn. However, the first year of my own illness had been spent at Saranac, and I could never bring myself to take the view that climate and altitude were of no value.

Experience with indigent consumptives has taught me the folly of advising them to travel long distances with insufficient funds in search of climatic advantages—and for such cases in the earlier stages of the disease the change from crowded tenements to sanatorium régime, country air, and good food is as great a spur as change of climate for the well-to-do. I think that this position is taken by every one, and as freely admitted by the defenders of climate as it is claimed by the iconoclasts.

In the past ten years groups of broad-minded, self-sacrificing men in

almost every large center have taken up the crusade against tuberculosis, and have given much of their time to work among indigent consumptives. They are now beginning to reap their reward. They are recognized as authorities, and called in consultation in almost every case among the well-to-do. It is perfectly natural that they would draw from their experience that tuberculosis is as easily cured in one climate as another. For every case of climatic cure they can show several who have recovered at home; that is to say, in a model institution or under their rigid supervision, and with the aid of the charity organizations. I cannot help feeling that any one with experience will admit that, with the aid of the adequate State or private benevolent organizations, it is easier to handle the poor and ignorant patient than it is to handle the more intelligent classes. The poor man must perforce obey implicitly the rules of those in charge of him, but the more well-to-do and intelligent often imagines he possesses an inherent knowledge of medicine which at least equals that of his doctor.

To claim that the home of the patient offers the best ground for his battle against the disease is, to my mind, wrong for more reasons than the lack of climatic change. I do not believe that any man has the right to pit his influence over the patient against the temptations and drawbacks that surround him in the home unless there are insurmountable obstacles to his changing environment. I do not believe that even the most radical advocates of home treatment claim that the well-regulated sanatorium offers no advantages over the home.

Aside from any dispute of a specific value of climate and altitude, the chief arguments against their use seem to be the following:

1. That the patient is in greater danger of relapse when he returns to his former home.

2. That he is apt to fall into incompetent hands, or to attempt to handle his own case.

3. That he will suffer from nostalgia.

4. That he will not, on his return, carry out the rules which he is taught while away as well as he would if he were treated at home and these regulations applied to his home life.

5. That the long journey is harmful.

In regard to the first objection, it would seem in itself an argument for the use of climate, for it is an acknowledgment of its possession of superior qualities over the home climate. From my own experience, I feel very strongly that the relapses after return are due in large measure to return to the habits of life which lead, in the first place, to breakdown. It would

seem to be carrying the "survival of the fittest" idea a little too far to say that, because some patients recover in spite of surroundings, the majority should disregard the advantage of change.

In regard to the second objection to change of climate, undoubtedly much of the blame must lie on the home physician. It is certainly his duty strongly to advise his patients to put themselves under competent men, and certainly the most favorable climatic resorts do not lack competent specialists. It is well known that in the past many of the western failures were due to the advice of the home physician to his patient to "go West and rough it."

I cannot help feeling that the third objection has very little to support it. Travel is so universal nowadays that there are very few who have never been away from home. Beautiful scenery, the joy of living which comes with improvement, the association with others who are traveling the same road, and the escape from the depressing sympathy of family and friends, in my experience, make home-sickness of rather rare occurrence.

The fourth objection might also be applied to school and college training. If each patient could afford to have a doctor devote his entire time to the case, results would be better, no doubt, than in the sanatorium, but unless this is done, certainly the great majority of cases will be better off in the sanatorium. And if those in charge of the sanatorium are the proper sort, the patient will not forget his teaching, nor will he fail to heed it any more than he would at home.

The last objection to a change cannot be used by those with experience in travel nowadays. The trip across the continent can be made with such rapidity and comfort, even luxury, that an invalid's condition need not be in the least unfavorably influenced by the journey.

These objections are being constantly and vigorously urged by those opposed to climatic change. And against them are arraigned the personal and clinical experience of men located in favorable climates, the comparison of unsatisfactory statistics, and very little sound argument of scientific value.

As to the claim of the unreliability of the statistics offered in support of the advantage of climatic change, there is, no doubt, ground for the argument. The amazing ignorance of proper methods of physical diagnosis of the chest, even among men specializing in tuberculosis, has led them to report results entirely out of keeping with those obtained by others. Not only is uniformity of classification needed, but every man reporting cases should be sure his methods of examination are as nearly as possible up to the

best standard. However, when one examines the reports of those known to use accurate methods of examination, there is undoubtedly a balance in favor of climate. Aside from the clinical evidence, which can be depended upon, it would seem to require much temerity absolutely to deny a belief which is coeval with the history of tuberculosis. Certainly, from the earliest mention of tuberculosis until quite recently the leading authorities have advocated the use of climatic change.

The science of meteorology as applied to its effect on the human organism has not made much progress. In reviewing the literature one finds that the claims made are based largely on theory and clinical experience. The psychical influence of change is held to explain much of the effect, but beyond the admitted fact that change of environment, aside from improvement of environment, does have a decided effect on the organism, little further explanation is attempted. One cannot help feeling certain that the extension of psychological investigation will deduce scientific facts in support of the value of change of climate. Although the two are usually considered together, the scientific facts in support of altitude are on a firmer footing than those of climate. It has been demonstrated that altitude has definite effects on metabolism, on blood-pressure, and on the constituents of the blood.

The advocates of climate claim the following points as important in the discussion of this factor:

1. Sunshine.
2. Humidity.
3. Temperature and temperature variation.
4. Wind.
5. The indefinite term "change."

1. As to sunshine, we all must admit its indirect influence on the spirits of people, well or ill. Just what direct therapeutic value besides that it has is a matter yet to be worked out. No one who has seen patients develop temperature and nervous symptoms from too great exposure to the direct rays of the sun can doubt its powerful influence. Some work has already been done toward using sunlight in laryngeal tuberculosis, and there are also some papers advocating exposure of the chest to the sun's rays. The question is yet unsettled, however.

2. It is very generally recognized that a high grade of humidity has a distinctly bad effect on the consumptive. The exact mechanism of this influence is not clearly explained, however, and here, too, there is room for careful scientific investigation.

3. Also regarding the almost universally admitted tonic effect of cold, there are few scientific facts on which to base the argument. I have been accustomed to tell my patients that the only good excuse I could give for summer is that it compels us to keep our windows open. The tonic effect of cold dry air is so universally recognized that it forms, perhaps, the best argument in favor of climatic change.

4. It is, I think, justly claimed that a dry cold wind, if not continued, has no injurious effect, provided it does not carry dust, while frequent moist cold or hot dry winds are to be avoided.

5. The psychological influence of change, aside from any physical influences of climate and altitude, is, of course, important—and the psychological change in the case of the consumptive is greater than that of a vacation for the healthy man. Any one with experience knows that, in the vast majority of cases, the patient is relieved when he has finally given up the unequal blind struggle against his disease and starts the battle along new and clear-cut lines. If he can get away from old surroundings and the misdirected zeal of well-meaning friends and relations to a bracing climate, beautiful scenery, pleasant companionship, and scientific supervision, who can deny that his chance of recovery is markedly enhanced?

Although there is still vast room for careful investigation, the scientific facts in support of the influence of altitude on tuberculosis are more clearly defined than those in regard to climate. It is admitted that altitude has a definite effect on the production of red blood-cells. The work of Bullock, Peters, and others has also proved its influence on blood-pressure. The work of Webb and Williams, confirmed by Holden and Bullock, adds the most conclusive scientific evidence in favor of the value of altitude. The influence of altitude on metabolism, while hardly brought to a scientific basis, is, nevertheless, clearly recognized. Probably the influence of deeper breathing and cooler air, as well as the influence on blood-pressure and the constituents of the blood, with other as yet unexplained influences, goes to make up this effect.

I hesitate to cite my personal experience in regard to the influence of climate, first, because I lay myself open to the criticism I have already made of the value of personal opinion from a scientific point of view, and, second, because I have only been in Colorado eight months. Nevertheless, I feel that, after six years' observation of cases treated without change of climate, I am now in a better position to make comparisons than those whose observations have been confined only to one side of the work. I have watched my cases very closely since coming West, and I must say that in several

instances the progress made was amazing to me. I have been accustomed to wait months for râles to clear up in cases past the incipient stage, but in two moderately advanced cases under my observation this past winter râles over an extended area have cleared up entirely. The progress in these two cases has been so remarkable and so far superior to anything I have ever seen that they have gone far to convince me of the specific value of climate and altitude.

I want to submit the following points in conclusion:

1. That while the majority of authorities seem agreed that there is some virtue attached to the change of climate and altitude, still the question can hardly be called settled.

2. That the men who live and practise in the so-called favorable climates are firmly convinced that these climates have a very definite favorable influence on tuberculosis; and that, therefore, they should not weary of well-doing until these claims are put on a very definite scientific basis—not only that we may no longer hear that climate and altitude have no value whatsoever, but also that definite rules may be established for advising patients what climates to seek and what to avoid.

The first letter I quote in full, as it seems to me that, without touching on any phase of the question which would be open to controversy, it answers the question completely. Of course, I value Dr. Trudeau's opinion above that of all others, and at the same time I feel that his argument cannot be controverted. His letter is as follows:

"My experience for the past twenty-five years has in no way altered my opinion as to the beneficial influence of climate in the treatment of pulmonary tuberculosis. Fresh air, food, rest, and climate are, in the present state of our knowledge, the main factors which, if used intelligently, are most potent in bringing about the arrest and cure of tuberculous disease. It is true that good results may be obtained without change of climate, but where a change of climate can be added to the other well-known factors which make up a favorable environment for the patient, better results can undoubtedly be obtained, and a judicious change from one climate to another will often turn the tide in a case which has ceased to improve and carry it to a successful issue.

"I don't believe, however, in any specific climate, and I don't think it can be proved that any one element in climate has a specific influence and is essential. The desert, the open sea, and the tops of high mountains are the three localities which have obtained the greatest reputation for the good results they have brought about in the treatment of this disease, and yet they all differ radically and absolutely as to sunshine, moisture, temperature, and elevation. Experience is perhaps, after all, the best guide, and any

locality which has been demonstrated beyond doubt to influence the course of the disease favorably should be utilized, irrespective of any theories as to the essential value of sunshine, temperature, dryness, or elevation. The stimulus which any particular combination of these factors gives to the nutritive processes of the patient is probably the essential factor in the favorable results obtained.

"I believe the value of climate in the treatment of pulmonary tuberculosis has long ago been established by abundant and overwhelming evidence, and that a change of climate is a factor in the treatment of this disease which should always be utilized in its treatment where it is possible to do so."

The next letter from Dr. Flick I also quote in full, to wit:

"I do not believe that climate has any curative value in tuberculosis. This belief is based upon my personal experience in change of climate, and upon my experience as a physician in treating tuberculosis. As a tuberculous subject, I sought the climate of New Mexico, Texas, Arizona, and California, and finally returned to Pennsylvania, where I believe I profited more than in any of the other places. I did not remain long in New Mexico, Texas, and Arizona on account of the difficulty of getting food which I could digest with the money at my command. After my recovery, I was told, according to the custom of that day, that I could not reside in Philadelphia, but I have resided there ever since, without serious drawback. Of the men of my age who accepted the dictum of that day and who took up their residence in Colorado, so far as I know, all are dead.

"As a practitioner of medicine, I have treated a great many cases of tuberculosis during the last twenty years, under all kinds of conditions and in various climates. Taking my experience as a whole, my results have undoubtedly been much better in the patients who have adapted themselves to their home environment than in the patients who have changed climate. Some excellent cases with favorable prognosis have gone West or South and have died within a year or two. Some of these were in good condition after treatment here, and would, in my opinion, have recovered and remained well if they had remained at home.

"I have treated a number of patients from the South and West who did poorly in those places and did remarkably well here. I have treated patients in the slums of Philadelphia and in the mountains of Pennsylvania without any difference in the results that I could make out. I have had poor people get well here in our city, while wealthy patients whom I was treating at the same time and who insisted upon a change of climate during the winter season have gone to a fatal termination.

"With these experiences and observations it is not possible for me to believe that climate in itself can have any curative value in tuberculosis. That it has no preventive value is proved by the large number of cases which develop in the best climates in the world, and the rapidity with which the disease becomes epidemic in those climates when introduced from without. Colorado and New Mexico now have a very large mortality from tuberculosis

in their native populations, according to the United States Census statistics. If climate had a curative value, that value ought to show itself in the prevention of new implantations, especially in countries in which the settlements are relatively new and not very dense, and in which the ordinary contributory causes of tuberculosis exist in a much smaller degree than in the older and more densely populated countries. The failure of the climate of Colorado and California in preventing implantations in their native populations is undoubtedly an argument against the curative value of climate. This argument, moreover, gains some strength in the fact that the population of California and Colorado is in part made up of the descendants of tuberculous subjects, who should, according to the laws of nature governing parasitism, possess a greater immunity against the disease than the average individual."

Dr. Flick bases his argument largely on personal experience and clinical evidence. So far as personal experience goes, with all due respect, I feel certain that a summer spent in some cool mountain resort, under sanatorium régime, would do Dr. Flick a world of good, even today. While I cannot speak from experience, I feel certain that the conditions in western resorts are vastly superior to those Dr. Flick found some twenty-five years ago. In regard to Dr. Flick's clinical experience with other cases, I cannot help making the same criticism that I have in regard to the clinical claims for the superiority of climatic treatment. Even if Dr. Flick claimed that, by taking the record of all his cases, he found that he got better results in Philadelphia than with those he sent to well-regulated institutions in more favorable climates, all I would then admit is that, which we all know is true, Dr. Flick is one of the foremost experts in the world, and that it is a pity that he is not located in Colorado.

Dr. Walsh writes that he believes that climate and altitude are entirely negligible in the treatment of tuberculosis. He refers me to a paper in the Journal of the American Medical Association in which he cites three cases successfully treated at home after failures under changed climatic conditions. I feel that Dr. Walsh himself must admit that these cases have no bearing on the question.

Dr. James Alexander Miller writes:

"Recent experience shows that tuberculosis in all forms can improve, or even get well, in any climate, and personally I feel that it is more what the patient does than where he does it that is important. The immediate environment (living conditions, etc.) plays the leading part. I feel that the summer problem is a most difficult one, and that, when possible, the patient should always be where it is cool in summer.

"I am a strong believer in the value of change. In a chronic disease like tuberculosis change acts favorably, just as a holiday does for the grind of tired working people. Some patients do much better in a climate like Colorado than they do East. On the other hand, not infrequently I have seen patients do well after coming back to the vicinity of New York, when they have searched in vain for improvement in many climatic resorts.

"The whole problem of the treatment of tuberculosis, to my mind, is one of individualization of each patient. I believe that there is no general rule, but that rest, exercise, feeding, environment, climate, altitude, and tuberculin are some of the principal factors in the treatment, and that the right combination of these differs widely in different patients. In general, I might state that I consider climate and altitude frequently as useful adjuncts in the treatment of tuberculosis, but by no means essentials."

It has always seemed to me that the beneficent effect of change was so manifest that the most rabid of those opposed to climatic treatment would admit its virtue.

In a letter from Dr. Otis he says:

"I regard climate of great value in the treatment of tuberculosis, and, other things being equal, I believe a case of tuberculosis possessing the possibilities of cure will have a better chance of recovery in a so-called favorable climate than in an indifferent one, like that of our eastern and northern States.

"As to altitude, I do not think that it has yet been proved that simple altitude has any favorable effect other than the greater purity and dryness of the air and the more intense sunshine—which are, of course, of great value."

Dr. Otis also refers me to his article on "Tuberculosis" in Musser and Kelly's "Treatment," and to a paper of Dr. Hinsdale, from which I will quote later.

Dr. Francine writes:

"I believe in the salutary effect of climate and altitude in the treatment of tuberculosis, associated always with sanatorium methods and expert supervision. I can best express my feeling by saying that if I developed tuberculosis myself I would come out to your great country.

"The majority of cases developing in the East must be treated in the East, for obvious reasons, and the results secured in favorable cases, even in our cities themselves, are most gratifying—so strikingly so as to have led some of our professional brethren to undervalue, I believe, the effect of climate and altitude *per se*.

"Thus, while climate and altitude are not in themselves *essential* to a cure, yet, as added factors, I believe in them thoroughly, and always wish to avail myself of them, circumstances permitting."

It seems to me that Dr. Francine's attitude is all that can be asked for by those advocating climatic change.

Dr. Hatfield writes as follows:

"As to altitude, I am opposed to allowing any of my patients with an active tuberculous process of the lungs to take up a residence at an altitude exceeding 2000 feet, or at most 2500 feet. In my experience, the effect upon such cases has not been good: I have found no good reason to think that the increased amount of work placed upon the lungs on account of breathing an air of less density is advantageous. As to chronic fibroid cases without marked constitutional symptoms, my feeling is much the same. Where a considerable extent of the lung has been damaged, in my experience there have developed always marked emphysema and the consequent discomforts. Of course, where there is a definite weakness of the heart, I prefer that my patients should remain at an altitude less than the limit of 2500 feet given above.

"As to climate, my opinion is quite different. All other things—medical supervision, family surroundings, household arrangements as to attendants, food, etc.—being equal, I decidedly prefer a tonic, dry region, rather cool than warm, and with sun for as many days as possible. This is based not upon successful experience in finding such a place for patients, but upon personal preference—that is to say, it is what I should like to do if I should contract tuberculosis.

"For the majority of cases, the order in which I give the requirements for successful treatment is as follows:

"1. Medical supervision: A physician, both competent to advise and able to enforce the carrying out of his directions, is to my mind the most important factor.

"2. Rest—physical and mental: This presupposes a sufficient income to do as one likes, and freedom from worry as to separation from family, etc.

"3. Suitable food.

"4. Climate, tonic, cool, dry, sunny—not uncomfortable for one who must live in the open.

"5. Altitude—always a moderate elevation.

"I realize that the above expression of opinion is inadequate and may not be helpful. Such as it is, you have it."

I cannot help feeling that his fear of high altitude is rather extreme.

The short experience I have had has embraced cases of every variety, and I must say that where patients are kept perfectly quiet, they accommodate themselves very quickly to the change.

Dr. Porter writes as follows:

"Climate should not be a therapeutic ignis fatuus. In the choice of a climate there should be a definite condition to meet a definite need. I used to believe in climate hunting, but when the Weather Bureau at Washington

reported that St. Louis had for eleven years within 10 per cent. as many hours of sunshine as Denver and less humidity than any large American city except Denver and St. Paul (or Minneapolis), I began to study our home advantages. When Professor Janeway wrote that an altitude of 1100 or 1200 feet was the best for the average case of tuberculosis, I naturally turned to our Ozarks, where we have a mean altitude of 1150 feet. I believe in Colorado for the consumptive who is not beyond the first stage, but I also believe in the Adirondacks, Asheville, New Mexico, Missouri, or in any other place where the patient can have home comfort, fresh air, rest, good food, and care for the individual symptoms. Statistics are often unreliable, so I venture to give my opinion."

The 10 per cent. Dr. Porter concedes is better than that afforded by government bonds, and, as I sit here in a delightful breeze, I cannot help picturing the present condition of St. Louis as described in the weather reports. Dr. Porter points out the fact that no one place should claim a monopoly of climatic advantages, and each offers to the discriminating physician points of which he may make use.

Dr. White writes as follows:

"I have no hesitation in saying I believe there is a great deal in climate, and something in altitude, in the recovery of cases from tuberculosis. My choice, however, would be a climate of clean air, about 1200 feet elevation, marked variation between the temperature of night and day, and a temperate to cold climate.

"I think we will all make serious mistakes in losing sight of the beneficial influence of clean temperate to cold, moderately elevated climates in the cure of this disease."

Dr. Gardiner writes:

"I feel very positive that dry air, dry soil, and an altitude of 6000 feet above the sea have a marked and decided effect on all human beings, and on the tuberculous tend to arrest the disease far more rapidly than a lower elevation or a damper air and soil."

Dr. Dawson writes:

"As to my opinion of the value of climate and altitude in the treatment of tuberculosis, I can only say that each individual seems to be a law unto himself, and the personal equation enters very largely into answering this question. A change of customary climate and altitude has always seemed to me to be beneficial. That is to say, if an individual in a dry climate and an altitude contracts tuberculosis at his home he will improve when sent to the sea-coast in a warm, moist climate, and vice versâ. There are some cases in which a change to an altitude seems to be a perfect panacea, and

there are other cases in which the altitude is distinctly deleterious. We have to study out each of these cases for ourselves. I wish I could help you out more in this matter."

Dr. Pottenger writes:

"I will say that it is impossible to give an intelligent opinion of climate and altitude in a few words. Climate means so much and embraces such a variety of different conditions that it is almost impossible to discuss it intelligently without going into detail.

"Climates for tuberculosis are divided into favorable and unfavorable, but what makes up favorable and unfavorable climates differs entirely according to the ideas of the one who is discussing the question.

"My belief is that climatic conditions which favor outdoor life, which have a large percentage of sunshine and afford moderately dry air, in which patients are subjected to a minimum danger from respiratory diseases, such as colds, bronchitis, pneumonia, are more favorable for the treatment of tuberculosis than climates which do not invite one to be out-of-doors, are damp and cloudy, and in which acute respiratory diseases are common. Such conditions can be found either in warm or cold countries, in the lowlands or highlands.

"The adaptation of the patient to the climate is a physiological problem. There is no best climate for all tuberculous patients, but that climate is the best where a given patient's body-cells work most economically. My personal belief is that the great majority of patients suffering from pulmonary tuberculosis, especially if they have advanced beyond the initial stage, are at a disadvantage at high altitude.

"The more I study tuberculosis, the more I believe that treating this disease is treating the individual. Of course, we must recognize the specific treatment as having general application. So must we recognize open air, but the matter of food, exercise, rest, climate—in fact, all other factors that I can recall, are individual in their application and must be suited to each patient independently.

"This last paragraph contains the gist of my thought on the question under consideration. I am sorry that I cannot give you something more definite. General statements which are so often given in medicine have no bearing, and I think we should get away from them as quickly as possible."

Dr. Bowditch refers to his discussion of Dr. Hinsdale's paper.

In a very interesting letter, which space will not allow me to quote in full, Dr. Bullock sets forth some of his opinions, as follows:

"If you will take the reports of all the institutions in the United States and Europe and go over them carefully you will discover, as I did two or three years since, that the results improved with every thousand feet of altitude gained. This is the best sort of empiric knowledge, and in my

opinion, settles the question. In spite of all the anti-climate talk we have had in this country, the fact remains that in the location of sanatoria back east the altitude feature is utilized to the full extent of the possibilities of the country; therefore, in my opinion, altitude, regardless of other climatic features, is the primary desideratum in the treatment of tuberculosis.

"The metabolic effects of change I need only mention. They are too well known to require elaboration. Although we do not exactly know why altitude is beneficial to consumptives, our faith no longer rests entirely on empiric evidence. At this institution during the past five years we have taken the blood-pressure in all our cases. Dr. Peters, my associate, two years ago embodied the result of this work in a paper in the Archives of Internal Medicine, and, except that we have now 500 cases or over to report, our conclusions are the same now as then.

"Dr. Thayer's statistics of blood-pressure in tuberculous people, published some years ago, showed the average blood-pressure at sea-level among them to be 25 per cent. lower than that for normal people. Our average blood-pressure here at 6000 feet, among all classes of tuberculous invalids, is about 25 per cent. higher than at sea-level, or about the same here for consumptives as for normal people at sea-level. A few days ago Dr. Peters and I took the blood-pressure statistics of normal people in Silver City, being careful to select only those in good health and who had never had tuberculosis. We found the average to be 25 per cent. more for normal people than at sea-level. We are absolutely safe in drawing the deduction that the toxemia of tuberculosis lowers blood-pressure, and that a high altitude is 50 per cent. efficient in remedying this symptom.

"We know that the erythrocyte content of the blood is increased by residence in a high altitude; in other words, that the secondary anemia of tuberculosis is rapidly remedied. We absolutely know that the confirmation of the chest is changed by residence in a high altitude. This was proved by Sir Hermann Weber sixty years ago, in an epoch-making contribution which entitles him to the credit of placing altitude therapy in tuberculosis on a scientific foundation. He, with Archibald Smith, Jourdannet, Gilberdt, and Lombard, in a volume entitled 'Climat des Montagnes,' showed not only the increase in the size of the chest, but also that slowing of the pulse occurred, as well as deepening and slowing of the respiration. They also showed that there was a lessened amount of urea excreted by the kidneys, and more carbonic acid and water by the lungs. Since their time Pasteur proved the relative freedom of mountain atmospheres from pathogenic organisms, and this accounts for the relative freedom of our patients in high altitudes from intercurrent infections. Professor Landouzy has shown that tanning of the skin bears some relation to curability, and Dr. Bowles has proved that tanning occurs much more readily in the attenuated atmospheres of high regions.

"In 10,000 relative blood-counts which I made at Fort Bayard twelve years ago I noticed the increase in mononuclear leukocytes, and, as well, the increase in polycells in fever cases. I discussed these findings before the

New Mexico Medical Society. Not having, however, Opie's work on the wax-digesting properties of the mononuclear cells, I could not interpret my findings, as Webb has done in later years. The above are the scientific data, plus obscure metabolic changes, about which little or nothing is known, which account for the better results of high altitude treatment. In the present state of our knowledge we cannot, of course, assign a rôle to each of these factors. Any one who lives in a high altitude region where consumptives come in great numbers must be most forcibly impressed by several things: the importance of the country to consumptives, as well as their importance to the country; that our children, the offspring of tuberculous unions, are exceptionally free from tuberculosis, which, however, they promptly acquire in a large proportion of instances by returning to sea-level to live. It is a well-known fact that mountain people are among the most vigorous in the world, and that those factors which make for the invigoration of the native population cannot but be effective among the tuberculous who are the antithesis, even prior to infection, of the native population of mountainous regions."

Dr. Lyman writes as follows:

"Am glad to hear from you and to see your enthusiasm as to Colorado. My experience has been that three-fourths of the people who go there are enthusiastic, and the other fourth cannot find mean things enough to say about it, especially about the winds. Here in Connecticut we do not have any one climate long enough for a man to form an opinion. I still hold to the perhaps unfounded opinion that it is better if a man is going to live here to treat him here, and that our results with thoroughly intelligent patients are much the same the world over. I do not think that if a man can make his permanent residence in a dry, sunshiny region his chance of relapse will be much smaller than exposed year after year to the rapid changes of our New England winter."

Dr. Bonney refers me to a paper in which he says:

"An intelligent discussion of this subject is quite impossible unless it be accepted, as a preliminary postulate, that the choice of climate, in all cases, should resolve itself into a question of individual fitness.

"Inasmuch as statements of a more or less generalizing character are required in reviewing the several considerations involved, it is manifestly difficult to define with accuracy the various classes for whom the Colorado climate is especially appropriate. In view of the necessary limitations imposed by virtue of varying individual conditions, the matter of climatic selection for each pulmonary invalid must be adjudged strictly upon the merits of the case, with full cognizance of the import attaching to all modifying circumstances.

"It is thus understood that there can be no single climate adapted to the needs of all pulmonary invalids. The temperamental peculiarities, the

divergence of pathologic processes, the degree of associated functional disturbance, and the financial status represent fundamental features emphasizing the importance of the utmost discrimination. Unfortunately, errors of judgment are frequently displayed in the selection of a locality for consumptives demanding some form of climatic change. This is undoubtedly attributable to inaccurate conceptions regarding the predominating atmospheric conditions in different regions, and the physiologic effect of these combined attributes upon an organism accustomed to a different environment and modified by disease.

"Further, among patients apparently in the same class, essential differences may exist in their constitutional vigor, as well as in the character of the possible complications. Hence, a vital consideration relates not only to the general physiologic action of the various climates, but also to the estimated degree of individual adaptation.

"In Colorado and other mountainous regions the climatic attributes capable of producing a profound effect upon the human organism are a maximum amount of sunshine, dryness, variability, moderate wind-movement, and diminished atmospheric pressure. As a direct result a pronounced influence is exerted upon tissue change of far greater importance than any supposed effect directly upon the pulmonary organs. Upon a stimulation of the animal functions metabolism is correspondingly increased, provided the invalid is able to respond properly to the unusual physiologic demands.

"It is apparent that, in high altitudes, a satisfactorily adjusted relation of response to demand, particularly with reference to the control of the mechanism involved in heat-production, is quite impossible for certain pulmonary invalids. While it is true that the Colorado climate produces an effective abstraction of heat, with a resulting influence upon nutrition, the capacity for a favorable reaction is not exhibited by all patients.

"It has been frequently asserted that the cold, dry air of elevated plateaus is appropriate only for incipient invalids with robust constitution and slight, if any, functional impairment. While patients in early stages, endowed with a sturdy physique and without complicating derangements, exhibit conspicuously favorable results in mountainous regions, often despite moderate physical exercise, a few consumptives, notwithstanding extensive impairment of pulmonary tissue and a considerable reduction in vitality, yet display most satisfactory results under the enforcement of rest.

"It should be understood, however, that functional disturbances are often aggravated when patients with greatly enfeebled vitality, impaired circulation, and very imperfect digestion are exposed to such climatic conditions. For this class, regardless of the duration or activity of the tuberculous process, nutrition is often promoted through the influence of warmth, equability of temperature, and increased atmospheric pressure.

"Recourse to the higher altitudes is obviously contraindicated for patients exhibiting extensive destruction of pulmonary tissue or marked emphysema. Warmth and equability, even with moisture, are better suited

to the needs of these invalids. The same is true of aged patients with diminished vitality, as well as the victims of perverted metabolism with pronounced pathologic changes in the heart, arteries, and kidneys. Tentative recourse to the Colorado climate, however, is permitted to many consumptives, even with slight degenerative nephritic change or with organic heart disease, provided compensation is adequate. In exceptional cases the climatic conditions are unsuited to the requirements of invalids displaying intense bronchial irritation or aggravated neurasthenic disturbances. Nervous derangements, however, are more often influenced unfavorably as a result of an inappropriate environment than of altitude *per se*.

"Generally speaking, invalids with moderate tuberculous infection, but with sufficient financial resources, may be encouraged to avail themselves of the benefits to be obtained in Colorado. An enormous class of consumptives is, therefore, offered exceptional opportunities to secure an arrest of the infection, assurances as to the ultimate result being, as a rule, more hopeful than in less favorable localities. Experience has shown that the Colorado climate is occasionally applicable to consumptives with active, advanced tuberculous infection. While the prognosis for such patients is of necessity more or less doubtful in any locality, remarkable results are not infrequently exhibited by virtue of the climatic influences, combined with a systematic régime.

"Important factors in this connection are the possession of a proper equipment as regards temperament, amenability to discipline, affluence, and a suitable environment.

"Recourse to climatic change is frequently the only alternative for many such patients, who, by virtue of their physical condition, are denied admission to local sanatoria.

"The extent of financial responsibility represents a practical and economic feature of the problem not to be ignored. There can be no greater error than the sending of hopeless, indigent patients to health resorts. Destitute consumptives are offered but scant opportunity for securing arrest, while serious hardships and grievous disappointments are almost necessarily endured. It should be remembered, however, that reasonably limited financial resources constitute no valid argument against the expediency of seeking relief amid advantageous conditions.

"A justification for permitting the journey, by these invalids, to a distant locality is found either in the nature and extent of the physical impairment, or in the possession of definite information regarding the expenditure necessary to secure appropriate accommodations. It is obvious that a decision as to the advisability of sending to Colorado consumptives in various stages of the disease, and, at the same time, with limited resources, rests largely upon the relation of the financial embarrassment to the degree of pulmonary involvement.

"Patients who are dependent upon their own efforts for support should be in such general condition as to justify the performance of outdoor work, and assurances should be received in advance as to the probability of success

in securing employment. It cannot be doubted that the possibility of a fortunate issue for such patients is greatly enhanced by pursuing their avocation in favorable climates.

"Many early cases are thus afforded facilities for securing a restoration to health. There remains another class, however, with perhaps more active infection, sufficient to preclude the performance of work, but who are less sadly handicapped financially. It is eminently rational to encourage such invalids to seek climatic change, provided arrangements are made for suitable accommodations and supervisory direction within the bounds of their monthly allowance

"If so satisfactory a provision is made for a sojourn in Colorado, a certain proportion of these individuals are destined to display highly gratifying results. It is essential that all consumptives, regardless of their status, should be duly impressed with the necessity of combining climatic change with systematic management."

Dr. Orville Brown, of St. Louis, refers me to a paper in which he says:

"Of all questions to be considered in connection with this problem, none is of greater significance than that relative to the change of climate for its effect on the tubercular process in the lungs. Unquestionably, a change of location is ofttimes beneficial, or otherwise this question would not have or have had so many strong supporters. With an equal degree of certainty, moreover, the change of location has done the tubercular patient harm, or at least not done him good, or the question would not have so many supporting its negative issue.

"Ordinarily, a change of climate takes a patient away from his business and the scene of his business, and it also takes him away from his friends, his home, and the comforts therefrom. The former is usually an advantage, and the latter is generally a serious disadvantage. Sometimes the effects of one will preponderate over the effects of the other, and determine whether the patient is to get better or worse. But there are also other factors of determining value.

"The atmosphere of one locality may differ from that of another in regard to its density, its humidity, its temperature, its change of temperature, its currents, its impurities, etc. The climate that is usually selected as having special advantages for tuberculosis is one where the air is rare and dry and often hot. First concerning the rarity: the needs of the system for oxygen remaining the same, the breathing must be faster and deeper than at a lower altitude, in order to get the required amount of oxygen. This will generally augur for harm, especially until the individual becomes accustomed to the high altitude. But the reduction of the intrabronchial pressure causes a hyperemia of the lungs, and this tends to do good.

"Webb has recently shown that the number of lymphocytes is greater at a high altitude than at a low. These have an influence in destroying tubercle bacilli. Of all the variable factors of the atmosphere, the temperature is the one of greatest importance, in the opinion of the speaker, and yet it is the

one about which little is said. The higher the temperature, the more rapid the chemical processes of the body, and hence the greater the demand for oxygen, and hence the more exaggerated the breathing activities, and, therefore, the more likelihood of a toxemia being produced. The cooler the tuberculosis patient is kept, the better it is for him. During the summer of 1909, which was a very hot one, practically none of my patients did well. And the improvement which began with the cool days of autumn was most striking. The humidity of the atmosphere makes a hot day seem hotter, because of the lack of evaporation, and makes a cold day colder, because damp clothing is a better conductor of heat. The latter can readily be compensated for by proper clothing, but the former is of distinct disadvantage.

"The winds are not important, except as they aid an exchange of atmospheres or as they become disagreeable. Impurities, such as the smoke of a city, may be a disadvantage, but these are generally greatly exaggerated."

Dr. Knopf writes:

"Some years ago there was a rather heated discussion on climate in tuberculosis at a meeting of the National Association for the Study and Prevention of Tuberculosis. I believe Dr. Flick and some one else had read papers, and I was asked to open the discussion. Instead of talking offhand, I had carefully prepared my maxims for the selection of climate in pulmonary, laryngeal, and bone tuberculosis. I have since slightly elaborated on them, and these maxims were reprinted in my recent book, 'Tuberculosis a Preventable and Curable Disease.' I was particularly pleased when so great an authority as Dr. Lawrason Brown, of Saranac Lake, wrote in Outdoor Life that my maxims on the choice of climate seemed to him eminently sound."

Dr. Dunham writes:

"In reply to your request for my views on climate and altitude, I will refer to a paper by Dr. Hinsdale which I am having forwarded. I agree with Dr. Hinsdale. I have felt, however, that it is almost impossible to arouse interest in a paper on climate unless one enthuses in favor of the West or detracts from its virtues emphatically; and it is always possible to cite cases in support of both positions. Personally, I think that 'climate' in its broadest sense is about the whole thing in tuberculosis, not barring tuberculin. For brevity I call the 'West' any place that is drier and more sunshiny and usually more elevated than anything east of La Junta, and, conversely, as regards the term 'East.'

"I think that the 'West' can do decidedly more for tuberculosis than the 'East,' but that it is not a specific for even every incipient case is a point that I would like to have enthusiastic westerners admit. Would they prescribe Albuquerque for the children at Sea Breeze Hospital? My own

opinion is that of *all* hopeful or favorable cases, nearly 40 per cent. are unsuited for treatment in the extremely dry and glorious climate of the Southwest. They get quite as marked and as sufficient change as is good for them by going out of our seaboard cities to some of the eastern mountains.

"I believe it is seriously detrimental for this minority to try to get acclimated and fight the disease in the extreme of climate covered by the word 'Southwest.' Their disease becomes active and advancing so soon after arrival (if not on the journey) that they are tabulated as unsuitable cases to have been sent West, although they were in a non-progressive and favorable condition before departure. Doubtless lots of advanced cases are sent West, but all those who die there did not start from the East hopelessly ill. I think it is extremely important that a patient starting on a new remedy should have a clear record of what the conditions were without that remedy. This especially applies to a radical change of climate. Physicians in the East make a grave mistake in not supplying their western confrères with complete histories and charts of cases sent to western resorts.

"In all discussions of values of 'East' and 'West' I have assumed that equal conditions other than the climate would prevail. My article (Colorado Medical Journal, March, 1904) compared a set of cases that were collected without the influence of personal equation entering in, and all had identical treatment aside from climate."

Dr. Baldwin writes:

"You must naturally know that I have very little technical knowledge about this subject, because I have paid very little attention to it. Personally, I believe that it is a question which has been settled so far as the treatment of tuberculosis is concerned. If Dr. Webb's observations about the effect of altitude should be confirmed, I think it would be an important element in the matter of the treatment of tuberculosis. So far I have not heard of any confirmation nor any control experiments on a large scale which would make assertions very safe as yet. I hope that he and his associates will continue to study it and give us some facts about it."

Dr. Lawrason Brown writes:

"The way that I have felt about climate—and I believe I have always felt much the same about it—and that is that it is of importance, but it has no specific effect, and that the most important element in clinical treatment is the stimulus which it produces on the general nutrition. As yet I have not had enough proof to lead me to change this position. The stimulus that a patient gets on changing his residence, even in a poor climate, is often sufficient to aid an early case to recover. This no one can deny. For more advanced cases and for a certain type of early cases a more radical change is needed. I do not believe that any health resort in the world sends more cases away from it to other places than Saranac Lake. I feel, however, that if a patient recovers in Saranac Lake, the change from Saranac Lake to

New York city is much less radical than from Colorado to New York, and consequently the patient's chances for remaining well are proportionately better. A certain number of cases will not get well in Saranac Lake; for them I believe that the high, dry climate of Colorado or New Mexico should be tried. You will get these patients from us from time to time. I am glad to hear that you are fighting against the idea that Colorado is the only place."

Dr. Sewall refers me to his sections on Climate in Klebs and Musser and Kelly.

Dr. Hinsdale, in a paper which covers the question most completely, calls attention to the fact that we have a "climate of the city, a suburban climate, a climate of the country," as well as the more distant mountain climates, all differing in many points.

In his discussion of the different climatic resorts Dr. Hinsdale is eminently fair and just. He calls attention to the fact that the government figures as to humidity are not a good index, as they report the conditions only twice a day.

He believes that, for the "majority of early cases, the climate should be dry and the temperature comfortable—not warm enough to be relaxing, but not so cold as to be repellent and restrict exercise or out-of-door life." However, he notes the splendid results obtained in the winter months at Saranac, and attributes them to the steady, dry cold.

He goes on to say: "As far as altitude is concerned, it probably has not, *per se*, any great influence; certainly to my mind not so much as we used to think. However, altitude is incidentally associated with mountain life, or life on the plains, with more sun, less moisture, and scattered population. We should not forget that surgical tuberculosis is always favorably influenced by a seashore residence suitably chosen." He then goes on to give the cases suited for altitude, and his classification I think the best I have seen.

Dr. Hinsdale wrote to the deans of medical colleges of Boston, Chicago, New Orleans, Los Angeles, and Montreal, asking each what he would do in case he discovered he had incipient pulmonary tuberculosis. All the gentlemen replied that they would change climate.

In discussing Dr. Hinsdale's paper, Drs. Bowditch and Otis spoke as follows:

[Remarks by E. O. Otis, M.D.]

"The oscillations of opinion and practice regarding the value and place of climate in the treatment of tuberculosis seem to me to be quite analogous to the varying opinions which have been held regarding the value of tuber-

culin. Both have had their apogee and perigee, their day of ascendancy and their day of decline. There was a time, and for many years, when climate was considered the essential factor in any attempt to treat tuberculosis successfully. For example, at one time almost every well-to-do patient in this region who was able to take the journey was advised to go to Colorado, and Colorado Springs may be said to have been largely founded by consumptives and supported by them, and very many cures were attained even when the patients were in a more or less advanced stage, as most of them were who were sent away. Now the pendulum has swung so far the other way that it seems almost archaic to discuss the subject of climate in relation to the treatment of tuberculosis. With many phthiso-therapeutists, perhaps with the majority, climatic treatment, in the sense in which it has been so well described this evening, is considered of little or no importance. Wherever, they say, pure air can be obtained, together with skilled supervision, there tuberculosis can be successfully treated.

"'I can cure tuberculosis in any climate,' Dettweiler once told me, as we were riding up to his sanatorium at Falkenstein, which was situated in a very indifferent climate. Experience has, indeed, shown that this is true; nevertheless, it is an indubitable fact, and attested by a large amount of accumulated evidence extending over many years, and by the experience of such authorities as Williams, Knight, Solly, Bonney, McGahan, and many others, that in the climate of many regions, particularly that of the Rocky Mountains and the great Southwest, at least certain consumptives do better, and obtain an arrest of their disease, which would be doubtful, if not impossible, in the so-called unfavorable climates. No one can read the cases cited by Bonney in his book on 'Tuberculosis' without the conviction that the climate of Colorado was an essential, if not the essential, factor in the favorable results he obtained in many of his cases. I recall cases which I believe would have never regained and maintained their health in the climate of this latitude. Granted, again, that the 'cure' can be successfully carried out in any climate where the air is pure, one must admit that it can be effected with far more comfort and greater contentment in a favorable climate, under constantly sunny skies, than in the harsh, changeable climate of northern latitudes."

After citing various points in favor of climatic change Dr. Otis says:

"There was no wiser or more experienced physician in the treatment of tuberculosis than the late lamented Dr. Knight, and I may be permitted, in conclusion, to quote a sentence or two from a paper of his upon 'Climate as a Factor in the Treatment of Tuberculosis,' which he read before the National Tuberculosis Association, and in which conservative opinion, based upon an extended and large experience, I heartily concur.

"'There is no specific climate,' he says, 'any more than there is a specific medicine, for tuberculosis, but there is no ground for supposing that a tuberculous patient is exempt from the effects of weather conditions upon the individual in health; and if we admit that weather conditions have any

effect, local or general, on the individual in health, then we must admit the possibility of utilizing this effect in treating morbid conditions of the body, tuberculosis included, and we must compare the possible effects of these elements, as we find them at home and as they may be found elsewhere, both upon the organs affected and upon the individual.' . . . And, concluding, he says, 'My own experience, both before and since the value of modern hygienic-dietetic treatment has been so generally recognized, has led me to continue in the belief that much is to be gained by the judicious selection of a patient's climate, or weather conditions, and we do not do our patients justice unless we consider the possible advantage of change when that is practicable.'"

[Remarks by Vincent Y. Bowditch, M.D.]

"Dr. Hinsdale has done well to come to us here, in the heart and home, as it were, of the advocates of home treatment for consumptives. His rich experience should help us to view the whole question with unprejudiced eyes, and enable us to come to the *juste milieu* in our attitude of mind, which is so desirable in all matters of discussion.

"In spite of the fact that, for the last twenty years, I have been urging the necessity of establishing institutions near our homes, not only for the cure of incipient cases, but for the care of the far advanced, I have never been able to place myself in the ranks of those who, knowing how much more we can do near our homes than was thought possible two decads ago, believe, therefore, that every case of tuberculosis can be treated as well in New England as in distant climates. This has always seemed to me an extremist's view, and one which is not in accordance with the results of my own experience.

"Numerous examples of this fact come without effort to my memory. Especially I recall one young man who was under my care for many months at the Rutland State Sanatorium. He was the despair of us all, for, in spite of closest care and adherence to accepted methods of treatment, he slowly and steadily lost ground until finally, quite discouraged, he decided to go to Colorado. He began almost immediately to improve there, held a position of trust in his profession soon afterward, and returned for a visit two or three years later, the picture of health, the disease having been entirely arrested; and at last accounts he was a busy practitioner in Colorado, and entirely convinced that it was the place for him." . . . .

"I could cite similar cases where I have tried to accomplish the desired result in New England, finally advising another climate with success. That the reverse may be the case is also quite true. I have had patients who, having gone to higher and more western regions, have returned to New England with consequent improvement in their symptoms. For this reason it is incomprehensible to me how the argument is used that because many patients undoubtedly improve and get well in some cases by using hygienic measures at home, all can follow the same course with equally good results without change. We must all recognize the usual tonic effect upon our-

selves of a change to a mountainous region, or even in going down to the sea. If, then, this is felt when in comparative health, why should we deny similar influences to our patients? It is a scientific fact, moreover, that high altitudes cause distinct circulatory changes, and even alteration in the blood itself. As to the good or bad effect of such changes, that is another question involving the skill and judgment of the adviser, but it is folly, in my opinion, to say that there is no possible use in sending a patient away if he fails to improve near at home. It is a matter of experiment to find out what will best agree with any individual. Every case must be considered by itself. We may find that a certain climate has a beneficial effect upon ninety-nine cases out of a hundred; and for some inexplicable reason the hundredth one of similar nature will need quite different treatment. This is a point which should always be explained to a patient lest he go blindly forward, adhering to one inflexible rule, even when the first experiment has not been a success. I am speaking now, of course, of suitable cases—that is, in which there is hope of cure."

Dr. Wolman writes:

"The scientific studies upon the subject are, to my mind, woefully meager. Clinical experience would lead one to think that some climates are more suited to certain types of the disease than to others, but these types have not been certainly differentiated. I believe the whole subject is awaiting more carefully collected statistics, based on the large work of a few men. However, I shall very much like to hear how you deluded your audience into believing we know more about the matter than we really do."

Dr. King writes:

"I hardly know how to answer your inquiry as to climate and altitude. To take the view that neither has any value *per se* is, in my opinion, absurd. That tuberculosis cases of a certain type do better in a high dry climate I am convinced, but just how to define this class I should find most difficult. Of one thing I am convinced, that climate and altitude have well defined, one might almost say specific, therapeutic indications, and some day we shall know what those indications are. I wish I could give you a more satisfactory answer to the question."

In these few words Dr. King voices my reason for writing this paper. Any man who has had the opportunity for observation must recognize that climate and altitude do have marked influence upon the consumptive; and also he must recognize the necessity for more scientific investigation into the question, especially since so many men are inclined to the radical views of Dr. Flick.

EXPERIENCE WITH PULMONARY TUBERCULOSIS DURING THE PAST YEAR—A CLINICAL RÉSUMÉ

By S. G. Bonney, M.D.
Denver

During recent years there has taken place a world-wide agitation toward the suppression and control of tuberculosis. Laboratory research has been stimulated, and a vast amount of laborious scientific work performed. An elaborate organization for the campaign has been perfected, and innumerable associations for the study and prevention of tuberculosis have been formed. Detailed investigations pertaining to sociologic and economic features have been completed, and interesting conclusions reported.

An important phase of the tuberculosis movement has been the educational propaganda, calculated not only to awaken general attention, but to instil into the public mind essential features of prophylaxis. The interest of the masses has been aroused through the medium of anti-tuberculosis societies, public lectures, exhibitions, and the wide distribution of tuberculosis literature. In many communities effective results have been attained through the enactment of wise municipal ordinances and their rigid enforcement by capable administrative authorities. It may be safely assumed that much good has already been accomplished, as shown by the diminished mortality-rate in a few of the larger cities. Apparently the greatest progress has been made in the cause of prophylaxis, as reflected in the improved hygienic conditions of the home, work-shop, school-rooms, and other public buildings. It may be questioned if, in the actual management of the disease, a corresponding advance has been achieved, although the comfort of many pulmonary invalids has been promoted by refuge in various institutions for hopeless cases.

A very considerable enthusiasm has been exhibited regarding new methods for the recognition of tuberculosis and the advantages of the sanatorium. A growing tendency has developed toward refinements of diagnosis and conventionalities of treatment. In the midst of the popular awakening as to the necessity of prophylactic measures, and the prevailing effort of medical advisers toward diagnostic proficiency, it is well to review certain

clinical aspects of the tuberculosis movement. It is impossible, in this connection, to discuss the significance of rational symptoms or the varying interpretation of physical signs. Neither is it designed to elaborate details of hygienic and dietetic management. While correct conclusions as to the relative merits of the sanatorium and judicious climatic change are not always entertained, it is of present interest merely to note recent tendencies of the profession in its advisory capacity concerning a class of people requiring most competent direction.

Are pulmonary invalids today profiting by early diagnosis, conservatism of management, and stability of judgment to a greater extent than a decade ago? It is possible that some information may be afforded by the experience of medical observers in various health resorts. Exceptional opportunities for a comparative clinical study of all classes are given to physicians residing in regions possessing climates so favorable as to attract patients from all sections and from long distances. This is particularly true of clinicians unattached to closed institutions which enforce rigid entrance restrictions. In the hope of presenting data which may prove of interest and reflect, perhaps, to some extent, the attitude of other medical observers, reference will be made to a few general and statistical observations. The results are based upon a personal experience during the past nineteen years in the supervision of over 3000 private cases of pulmonary tuberculosis the records of whom have been preserved.

The unavoidable limitations and deficiencies of statistical contributions are well known. Sources of error, however, have been eliminated, as far as possible, and much labor expended to render the analysis accurate and simple. In a clinical retrospect of this character it is obviously appropriate to introduce only such material as may have practical significance, and permit reasonable conclusions with reference to certain important phases of the general subject.

In my earlier experience in Colorado ample opportunities were afforded to note the unfortunate results of delayed diagnosis. In most instances a comprehensive review of the history and subjective symptoms, together with thorough physical and bacteriologic examinations, would have sufficed to establish a much earlier recognition of the disease. While the more recent means of diagnosis were not at that time available, intelligent recourse to the old-fashioned methods would, to a great extent, have prevented disastrous delay.

It was found, from a compilation of statistics made some years ago, that the average period of delay in 2300 patients before arrival in Colorado was

eighteen months. Notwithstanding the diversified character of cases and the relatively large proportion of those in moderately and far-advanced stages, the results obtained upon the whole were of such a nature as to dispel any possible doubt as to the advantages accruing from a wisely directed climatic change. Instances of mistaken diagnosis were then comparatively infrequent. While patients were found from time to time to have been instructed injudiciously, the difficulties of subsequent management were not pronounced. Invalids, as a rule, did not entertain preconceived notions as to their individual needs, and hence were usually amenable to advice and supervision. They were duly impressed with the possible gravity of their condition, and had not imbibed an idea as to the curability of tuberculosis at home. A large majority of the patients were sent away directly upon the advice of the family physician.

In November, 1909, in a paper embodying the study of 313 pulmonary invalids coming under observation since the publication of other statistics, some data were submitted suggesting changing tendencies of the profession in the diagnosis and management of tuberculosis. An interesting feature was the surprisingly large number sent to Colorado upon a mere suspicion of tuberculosis. In 90 instances, or more than one-quarter of the cases presenting themselves for examination, the physical exploration of the chest was entirely negative, while tubercle bacilli were unrecognized in the sputum in 87. They were occasionally found even in the absence of physical evidence of tuberculosis, and the reverse was also true in some instances. "Of the doubtful cases without either physical or bacteriologic evidences of infection, the tuberculin test was negative in 41." Although in 87 cases the period of indisposition had lasted merely from two weeks to four months, the average period of delay for the entire number was found to be sixteen and one-quarter months, thus corresponding rather closely with previous observations. One hundred and twenty-five, or nearly two-fifths, were found to be in advanced stages, 62 dying not long after arrival, and 16 being sent home as utterly hopeless. With 90 classed as doubtful, including 41 adjudged non-tuberculous, and with 125 as very advanced, a comparatively small number were found to exhibit an infection of incipient or moderate degree. Comment was then made upon the fact that, despite a positive cutaneous reaction, a definite diagnosis of an active tuberculous involvement was often subject to some doubt. While a very considerable number of such cases were thus impelled to journey long distances, many clearly tuberculous patients exhibited complications of such a nature as properly to have contraindicated their departure, persisting albuminuria being pres-

ent in 25 instances, an incurable infection of the larynx in 15, and intestinal tuberculosis in 7. A typical pneumonic onset was exhibited in 19, the disease pursuing the characteristic course of acute pneumonic phthisis in 12. Cardiac dilatation was occasionally observed, dyspnea from various causes not being infrequent.

As a result of this analysis two central thoughts were suggested: First, it appeared that attempted overniceties of diagnosis sometimes resulted in the incorrect interpretation of physical signs, a judicious discrimination not always being in evidence as to the relative importance of the various features. In the commendable zeal for early diagnosis it seemed that a source of error was found in our enthusiasm to recognize somewhat obscure physical evidences of infrequent occurrence and doubtful import. Secondly, it was apparent that, in advanced cases, faith in the efficacy of the home treatment and in the advantages of local institutions was responsible to a degree for the disastrous delay, and hence in some cases for the unfortunate condition of those seeking climatic aid as a last resort.

Attention was further called to the increased frequency with which tuberculin was administered as a routine procedure, irrespective of modifying conditions. A source of some surprise was the frequency with which the mercury treatment had been given. A stuffing process had been occasionally instituted, notwithstanding contraindications found in the digestion, circulation, or elimination. A tendency was observed to minimize the importance of rest and to advocate less unreservedly the value to be derived from exercise, not always within moderate bounds. Attention to the temperature and pulse apparently was not always a guide to the degree of physical exertion permitted.

There was convincing evidence to suggest that the necessity of strict obedience to hygienic precautions had been duly emphasized. Patients and accompanying members of the family were frequently found to have acquired a fund of knowledge as to the nature of the infection and the details of treatment. With many, particularly those of a judicial mind, the previous course of instruction was found to be of signal advantage. Others with unfortunate peculiarities of temperament and disposition were found altogether too familiar with the subject—in short, were overeducated to such an extent as to render them difficult of subsequent management. The resourceful control of the consumptive, which is a necessary preliminary to the control of the infection, was not always easy, provided fixed ideas as to the value of remedial agents, and prejudices relative to various methods of procedure, had previously been formed.

In view of these observations of a statistical and general character, it has been of some interest to analyze my experience during the past year, to ascertain if previous impressions are to be confirmed or modified.

During the twelve months ending November 1, 1910, 222 new patients having real or supposed tuberculous involvement have presented themselves for treatment, the large majority seeking medical counsel immediately upon arrival in Colorado. In addition, there have been under supervision during the year 80 who had been under previous observation, making a total of 302 consumptives furnishing material for further analysis. Of the 222 new patients, the physical and bacteriologic findings were negative in 55. Several before arrival and subsequently responded positively to one of the integumental tests. A large proportion of these patients were influenced to leave home immediately upon the development of cough, elevation of temperature, slight loss of weight, general malaise, or other suspicious symptoms, and in very many instances even without the advice of a physician. Some presented the history of bronchitis of indefinite duration, asthma, emphysema, general debility, malaria, and neurasthenia. Symptoms suggestive of mixed infection were exhibited by 19, and corroborated by the bacteriologic findings. Of these, 13 presented the history of one or more pulmonary hemorrhages, in none of which were tubercle bacilli discovered. The thought is conveyed that possibly hemoptysis among non-tuberculous invalids is more frequent than commonly supposed. Attention has previously been called to fairly numerous instances of pulmonary hemorrhage resulting from vicarious menstruation, purpura hæmorrhagica, and circulatory embarrassment incident to chronic bronchitis, emphysema, and pneumonoconiosis. Nearly all patients having one or more hemorrhages without definite evidences of tuberculous involvement presented the history of a sudden onset with chill, fever, cough, and expectoration. In a few cases the clinical course had been of so acute a type as to suggest the probability of an actual pneumonic process with a central or concealed area of involvement. In one or two cases a definite recognition of the pneumonic consolidation was obtained after arrival in Colorado.

Six patients were found to have developed tuberculosis in Colorado, 4 without apparent cause, 1 as a result of dissipation, and 1 following chronic bronchitis and pneumonoconiosis.

Of the remaining 161 tuberculous patients coming during the year, the average period of delay before arrival was thirteen and one-half months, thus showing a gratifying change from previous years. More than 50 per cent. left home within six months after the onset of the disease. A large

proportion of the balance had been to various health resorts for such prolonged periods as to increase the average delay for the entire number to thirteen and one-half months. It thus appears that the present tendency is for pulmonary invalids either to seek climatic relief, or to avail themselves of institutional advantages somewhat earlier than in previous years. It is noted, however, that not infrequently early climatic change is found to have been directly opposed by attending physicians.

Thirty patients presented the history of a prolonged sojourn in institutions for consumptives. Of these, 5 had exhibited satisfactory improvement, 4 had gained substantially and then relapsed, 2 exhibited no physical or bacteriologic evidence of tuberculous infection, one of these having resided two years in a sanatorium, taking tuberculin during the entire period, and the other as often as every other day. Nineteen apparently failed to derive even temporary benefit, and experienced, as a result, not only loss of time, but of opportunity. Of these, 1 had remained in an institution nineteen months, 1 two years, 2 had been in three sanatoria, and several in two. Of the 30 patients, 24 were far advanced, 2 incipient, and 2 without demonstrable tuberculous infection.

In the classification of patients an effort has been made to conform strictly to the schema adopted by The National Association for the Study and Prevention of Tuberculosis. In accordance with this grouping there were 27 incipient cases, 42 moderately advanced, and 92 far advanced. Attention has been called by writers to the enormous number of advanced consumptives sent to western health-resorts. It has been estimated that about 50 per cent. of the pulmonary invalids seeking climatic change are without the slightest possibility of cure in any region. This appears to be somewhat in line with my own observations, as of those with demonstrable tuberculosis coming to Colorado during the past year nearly 56 per cent. were in very advanced stages, 26 per cent. moderately advanced, and but 16 per cent. truly incipient.

Further information is afforded by a study of the records with reference to the temperature, pulse, weight, and important complications. Of the 161 patients, statistical material is fairly complete in 150 cases. Of these, 108 exhibited a temperature of 100° F. or above at time of arrival, 45, 101° F. or above, and 20, 102° F. or above. In 115 patients the pulse was 100 or above, in 48, 110 or above, and in 37, 120 or above. The lack of correspondence between the physical signs and the pulse and temperature has been frequently noted. A number of patients classified as moderately advanced or far advanced have sometimes offered a relatively favorable

prognosis upon the basis of but slight elevation of temperature, an excellent pulse, good appetite, and digestion. Others presenting the physical signs of incipient involvement have exhibited occasionally high fever, acceleration of pulse, nervous disturbances, and important complications, in addition to temperamental peculiarities and other conditions inimical to favorable results. The average loss of weight for the entire number before coming to Colorado was 20½ pounds. The amount for the incipient class was 13½ pounds; for the moderately advanced, 16 pounds; and for the far advanced, 24½ pounds.

The following complications were observed: Tuberculous laryngitis, 20; tuberculous pharyngitis, 2; intestinal tuberculosis, not inclusive of fistula, 9; tuberculous peritonitis, 2; tuberculosis of the bladder, 2; tuberculosis of the kidney, 3; miliary tuberculosis of various types, 8; tuberculous glands, 1; perirectal abscess, 4; acute pneumonic phthisis, 5; pleurisy with effusion, 3; pneumothorax, 2; valvular cardiac lesions with varying degrees of compensation, 4; syphilis, 7; malaria, 5; diabetes, 2; advanced nephritis, 2; pregnancy at time of arrival (far-advanced case), 1. Albuminuria was noted in 61 patients. In many instances this consisted of a very slight trace, sometimes undetected by the nitric acid test, but becoming definitely recognized by the heat test with acetic acid.

In attempting to estimate the results obtained among patients coming during the year, much difficulty is encountered by reason of the comparatively short period of observation, the extremely desperate condition and brief sojourn of a considerable number, the mixed character of the cases, the differing circumstances, the not infrequent necessity of work, and, for some, the unavoidable absence of continuous supervision. Under these conditions it is possible only to form an approximate conclusion as to the degree and permanency of the benefits derived. In analyzing the results, however, a studious effort has been made to compile the statistics accurately.

It was not adjudged fair to include 35 patients remaining under observation but a very short time. Conforming strictly to the schema adopted by The National Association for the Study and Prevention of Tuberculosis, it was found that of the remaining 126 irrespective of class, 29 did not improve, 30 improved, 43 were arrested, and 24 were apparently cured. None could be classed as actually cured on account of the shortness of time—two years without constitutional symptoms, or without physical or bacteriologic evidences being required to permit inclusion in this classification.

Despite the diversified character of cases and the large prodominance of those in far-advanced stages, 77 per cent. have thus far exhibited degrees of

improvement, nearly 35 per cent. being arrested cases, and nearly 20 per cent. being apparently cured.

An analysis of results with reference to the several types shows that, of the incipient cases, there were none who were not improved, 6 improved, 6 arrested, and 8 apparently cured. Of the moderately advanced there were 3 unimproved, 5 improved, 13 arrested, and 11 apparently cured. Of the 3 classed as not improved 2 had shown very pronounced gain in all respects until death resulted, in one instance, from aneurysmal hemorrhage, and in the other, from meningeal tuberculosis. The third was compelled to work daily in order to provide for the necessities of life for himself and family. Of the far advanced, there were 26 unimproved, 19 improved, 24 arrested, 5 apparently cured, and 21 were either sent home or died very shortly after arrival.

Further information as to the progress made is acquired by a comparison of the gains established in body weight, suggesting an increased resistance to the tuberculous infection. Of the far-advanced cases who did not return home or succumb almost immediately, the average gain in weight was 9 pounds; of those moderately advanced, 14 pounds, only one in this group having failed to exhibit some improvement in this respect. Of the incipient cases, the average gain was 15 pounds.

Among the 90 patients coming in previous years, but remaining more or less under observation during the past twelve months, the results are grouped as follows: Not improved, 16; improved, 23; arrested, 32; apparently cured, 11; cured, 8. Of these, the average gain in weight, inclusive of those who did not survive, has been 16 pounds, despite the fact that 8 failed to show any gain whatever. Of the 11 who died, 9 had gained materially in weight as follows: 3, 5 pounds; 2, 10 pounds; 2, 30 pounds; 1, 12 pounds, and 1, 8 pounds.

Twenty-seven of the entire number observed during the year have died, a fatal termination being induced by exhaustion from advanced phthisis in 19; aneurysmal hemorrhage (instantaneous) in 3; aspiration pneumonia following hemorrhage in 2; bronchopneumonia in 1; nephritis in 1; tuberculous meningitis in 1; intestinal tuberculosis in 1; Schede operation in 1; pulmonary type of miliary tuberculosis in 3; and meningeal tuberculosis in 5.

The significance of the report as a whole is augmented by the fact that many were compelled to seek employment and were thus unable to conform to the régime in vogue in special institutions. Others were so handicapped financially as to preclude proper nourishment, and in some instances suitable accommodations.

A review of the foregoing statistical data serves but to accentuate pre-

vious impressions with reference to the early diagnosis and management of tuberculosis. From these studies it seems reasonable to assume that, while much has been accomplished in the past few years in the education of the public, there is still something to be desired. It is to be expected that, among different clinicians in varying localities, divergent views should be entertained according to the peculiarities of individual experience. In this instance due significance must be attached to the number of persons sent away from home without positive evidence of tuberculosis, to the comparatively few early cases, the large proportion in moderately or far-advanced stages, and the frequency of incurable complications. Opportunity has been permitted to note the disadvantages of routine tuberculin administration and the inevitable limitations of the sanatorium, unless in a properly coördinated relation to other important measures of treatment. It is vitally important to recognize the value of a properly selected climate, the fundamental consideration being that of individual fitness. It is well known that, notwithstanding a possible unhygienic environment and improper food and clothing, many incipient cases do recover at home, and that, despite unfavorable climatic conditions, others somewhat more advanced may exhibit periods of improvement while confined in closed sanatoria. While consumptives may recover in unsuitable regions, they are more likely to do so in localities wisely selected with reference to individual needs. In some instances prompt recourse to a suitable climate represents the determining factor, but this is capable of exerting its greatest influence only when combined with a reasonable interpretation of modern hygienic and dietetic management. Experience has shown that many patients who, through financial distress, are deprived of the advantages of a supervisory régime, nevertheless are permitted to secure improvement amidst favorable climatic surroundings. To those compelled to work for a livelihood sojourn in a suitable locality may offer the only means of an eventual restoration of health. An arrest having been secured, a continued residence precludes in many instances the relapse so common among individuals returning to their former occupations at home. In the interest of the consumptive class it is to be hoped that an increasing appreciation of the value of climate for properly selected cases may be justly entertained.

DISCUSSION ON PAPERS BY DR. FORSTER AND DR. BONNEY

Dr. Theodore B. Sachs, Chicago: It is agreed that the vast majority of tuberculous patients have to be treated, of necessity, in their home climate.

As to those so fortunately situated as to receive the full advantage of climatic treatment, we must bear in mind the following: Selection of climate, suitable in an individual case, must be based on full consideration of all features of the case and a thorough knowledge of the beneficial effect and the drawbacks of various climates in various groups of cases. High altitude is beneficial in some cases and detrimental in others; the same refers to other factors of climate, as the degree of moisture, temperature, etc. The medical profession is in need of more exact knowledge of the principles of medical climatology, knowledge based on facts and ripened by experience. In gathering and analyzing facts as the basis of this more exact knowledge, the medical men of the western states have before them a task but partially fulfilled.

Dr. Ethan A. Gray, Chicago: Dr. Bonney has pointed out that continued residence in this climate precludes the probability of return of the disease. That question of continued residence is a thing that troubles us when we send a patient away. In working out this matter myself I have come to the conclusion—and a large number of men in the eastern Mississippi Valley agree with me—that if a patient can be started well on the road to recovery in his home climate, the climate of California, New Mexico, Arizona, or Colorado can clinch the nail already driven. When a patient is cured in Colorado or any other State, we are confronted with the possibility of recurrence of his disease, even under the most favorable home conditions. In this connection I am reminded of a case which came under my observation last summer, the patient returning from Albuquerque, where he had been for some years. On his return there were no signs of moisture in the chest; no temperature for the three or four weeks following; during this time the patient was put at rest, in view of the danger of recurrence; yet in the fifth week, without, to my knowledge, any unfavorable action on his part, râles appeared, cough occurred, and the temperature rose. After a week of a marked rise in temperature, distinctly typical, he returned to Albuquerque and immediately picked up again. These people do not want to live always in a "health" climate; sometimes they like to go home again. I think it is a mistake to hold a patient in his own climate when he is doing badly, and yet we do not know always where to send such patients. We are not always able to form judgment correctly in regard to this matter, but if we can take care of a patient in his home climate, as we do in many cases, we will do better than to send him elsewhere.

Another point is that patients come to this country without much money.

They have about twenty or thirty dollars a month, and I believe that one of the first things we should impress upon a patient when he goes to a health climate is that the following essentials are required: First, money; second, more money, and, third, still more money. We know that a patient cannot get well on climate alone. He needs rest. He needs comforts. He cannot get these away from home. If he be an ordinary wage-earner, it puts the rest of the family into a condition of penury, and that is a phase of the matter which we have to consider from both a social and a medical standpoint.

Dr. J. D. Gibson, Denver: In regard to patients who have been sent to Colorado and have recovered, I will say that patients that have been in Denver and Colorado and have gotten well are not fit to live anywhere else because they do not want to live anywhere else. If you send them home, they will not stay; they will come back because they would rather live here in Colorado than anywhere else.

I would like to ask the gentleman who preceded me, or the gentleman who read the paper on climate, what the effect of tuberculin would be in patients who returned home, whether they stand the eastern climate better after the use of tuberculin than when climate is depended upon by itself. It strikes me, after the use of tuberculin, they ought to be able to stand their former place of residence better than just with simple climate alone.

I do not think there is any comparison to be made in treating tuberculous patients in Colorado and in the East. I know something about this from personal experience. I was in bed myself in Alabama for several months with tuberculosis. When I found I had tuberculosis, I decided to come to Colorado, simply because I think today, when we have all the good things we have got in handling tuberculosis cases, we have nothing too good if tuberculosis has a strong hold on you, so that in treating tuberculous patients we are not doing too much when we give them the best we can. When we consider what Dr. Welch, in his address this morning, stated, that up to fourteen years of age, 95 per cent. of all the population are more or less tuberculous at one time or another, we are bound to admit that a great many get well at home or in any climate; but when a case has progressed so far as to disable the patient, with elevation of temperature, night-sweats, and fever, we ought to consider that patient in danger in the climate he is in, and I believe that, with a judicious selection of climate, we can accomplish a good deal. Patients with a weak heart should not be sent to a high altitude, but with a judicious selection of climate I think it is one of the greatest, probably the greatest, agents we have in the treatment of tuber-

culosis. When a patient comes from a low altitude and goes into a high one, he must have intelligent supervision, and when he first comes is the time when the heart must be watched closely, when the conditions have to be taken care of, and I think you will agree with me when I say that a high altitude is really strenuous on a well man, and what must it be on a sick man? You will find a great many patients when they first come here seriously advanced with tuberculosis walking on the street and trying to work and doing everything they ought not to do because they do not understand the situation. Many of these patients die or return home and give us a black eye in Colorado; but the patients who come into Colorado and are intelligently handled, and not too far advanced, find that climate is a wonderful adjunct to their treatment.

Dr. J. W. Kime, Fort Dodge, Ia.: I rise to relate my own personal experience in connection with the climatic treatment of tuberculosis. During the past ten years I have had a large number of tuberculosis patients under my care, and something like forty of these have become infected with the idea that there was a specific climate somewhere. These patients have been divided up between Colorado, California, New Mexico, and Arizona. Of all the patients in the various stages of the disease, from the first to the third, I now have one of these alive in Colorado, over forty of them having died.

I believe the story of tuberculosis is no different in Colorado from what it is in Iowa and in the other States of the Union. I am not one of those who believe, after years of observation, that there is a very great amount of difference in the treatment of our cases anywhere, and we are coming more and more to believe, in the Mississippi Valley and in the East, that our patients will do better when they are treated near their own homes or at their own homes. We have in Iowa 8000 cases of tuberculosis. It is simply absurd to talk of treating any percentage of these cases at all in other States than in Iowa. The same is true in Illinois and in other States of the Union; and, taking the results of our observations and the observations of practically all physicians in Iowa, these cases are not doing materially better elsewhere. Our profession is rapidly coming to the conclusion that the best place to handle our own cases is in the State of Iowa, and we are doing so.

Dr. Oscar M. Gilbert, Boulder, Colo.: There is plenty of room for argument with reference to the question of climate, but there is one thing upon which I believe we all agree, in the interest of the patients and among ourselves, and that is, we should send these patients early or not send them

at all. That is the common complaint which we have out here against those who send patients to us. We get your patients after you have gotten all their money and they have lost every chance for recovery. To send a patient who is doing badly, has a dilated heart, rapid pulse, and mixed infection, with every indication of rapid dissolution, to Colorado—to a high altitude—with instructions to go out, and rough, it is criminal. I think it is a great mistake, which I know the majority of the profession do not make, but it is a mistake, nevertheless, which is too often made. The great hope has been pointed out in Dr. Bonney's paper, in that we are getting these cases earlier than we formerly did. Just yesterday I received a patient who had been sick since the twenty-second of last month. He was sent to me as soon as the earliest symptoms appeared, and the same physician who sent this patient to me had previously sent me advanced cases, and I said to him, "For God's sake, send these cases sufficiently early so that there is some hope of curing them."

There is no specific climatic treatment. Patients die here in Colorado. They contract tuberculosis here occasionally, so there is no specific climate that will cure all patients. We do believe, based on our experience here and in the East, that patients do better on an average under the same conditions here, with better prospects of recovery, than they do in the East and middle West.

The work of Dr. Webb and others with reference to the importance of the leukocyte count has been referred to and mentioned as a reason why cases do better in this State than in the East and elsewhere. That, I believe, is not due altogether to altitude, but to the sum total of conditions which contribute toward raising the immunity to tuberculosis. It only needs, it seems to me, continued observation of any of you to convince you of these facts. The number of native Coloradians who contract tuberculosis here is small, except in the congested centers of the State, and it seems there is some exception in those who have not, as Dr. Welch told us in his address, received the vaccination of early childhood. Take the Indians and some of the Mexicans, who have never been exposed to this infection: when the disease does attack them in their unsanitary conditions, they are more susceptible, but to the ordinary individual there is a decided immunity against tuberculosis in Colorado.

Dr. J. G. Dorsey, Wichita, Kan.: My experience has been mostly with the laryngeal form of the disease. Our altitude is about 1300 feet. When such cases have come under my observation, I have found that a lower altitude will do these patients good. If they return to a low altitude,

one which is not as high as this altitude, they usually have a return of the disease, and die more rapidly than if they had not changed climates. Some of these patients have come to this climate, but had to go on to a lower climate before they received benefit. I have found that most of my patients who came here with laryngeal tuberculosis have found it necessary to return to a low altitude or to one much lower than they had been living in. Some of the patients that went to a lower altitude have come back, thinking they were cured entirely, having been away two years, and, without any examination by the physicians in the neighborhood to which they had gone, had been advised they could return home. In a few months they have either had to return or have died from the disease.

Dr. A. G. Shortle, Albuquerque, New Mex.: In the matter of results, I think we can hardly take the statistics that are compiled today and make a fair comparison. I am sure that any man familiar with the work in the West will admit that we have to work with the unfavorable cases. I was thinking that Dr. Bonney was particularly favored when he was reporting a large number of incipient cases. I think most of the young doctors, at least, have to do almost entirely with the moderately advanced and the far-advanced cases. As a rule, they are cases that have failed to improve in the East. To take them and compare the results of sanatorium work of the West against sanatorium work of the East is not a fair comparison.

Coming to the matter of the patient's ability to return East and to remain well after being cured in the West: I think from what has been said that this is purely theory and against facts. We know some of the German sanatoria have shown that patients cured in their own climate relapse to the extent of 70 per cent. within five years, and I think that, if we could compare the cures in Albuquerque, Denver, and other western points against that, the comparison would be very favorable. A patient who is cured here and goes back to the East and has a relapse is a case that would not have gotten well in the East. He is the one who makes up our higher percentage of cures.

I wish to take exception to some of the statements in Dr. Flick's letter. First, in the matter of high percentage of deaths in New Mexico due to tuberculosis. I cannot give you the exact figures, as they are not very well compiled, but I can say, after a long residence there, that the percentage is not high, but, on the contrary, is decidedly low. He says that the mortality in New Mexico from tuberculosis was as high as that in the East. He does not mention that the mortality is due almost wholly to transient cases that go there as health-seekers. This feature should be considered.

In Albuquerque and Silver City, and in some other towns where there are a large number of sanatoria and a large tuberculous population, and particularly in Albuquerque, where there are 1500 transient tuberculous people, according to the city health physician, there would naturally be some infections. I examine some 300 or 400 cases in a year that are tuberculous,—I do not treat that many, but I examine that many each year,—and I have found in three years three cases that apparently originated in New Mexico.

In the matter of the Indian and the Mexican, the native population to which reference has been made, there is a fair mortality among the Indians, but, as was proved by a paper some few months ago, written by one of the government physicians whose name I do not remember, the mortality or the percentage of tuberculosis among the Indians in the Southwest is less than among the Indians in any other part of the United States.

Their life is very conducive to such an infection. To begin with, the Pueblo Indians near Albuquerque sleep in their thick-walled buildings with all the doors closed, six or eight people in one room. Their table is simply the floor. They spit on the floor, and afterward put their tortillas and other eatables there. So it is not to be wondered at that, with 1500 health-seekers, some Indians contract the disease, and when they do, the whole family gets it, which will very well explain the small mortality from tuberculosis that occurs in New Mexico.

Dr. Frederick C. Smith, Fort Stanton, New Mex.: I believe it is very generally accepted that there is no longer any authority or any casual observer of tuberculosis cases who claims specific properties for any climate.

While high altitude is conducive to an increase in the red blood-cells, it is pointed out, by equally good authorities, that a low altitude is favorable for pulmonary rest, and that rest of the lungs in pulmonary tuberculosis is just as essential as rest of the bones in bone diseases. It does not seem to me that a discussion on the specific virtues of any climate can be fruitful.

An analysis of the mortality among the Indian tribes from tuberculosis shows that the mortality from this disease in the different tribes of Indians living in New Mexico and Arizona is just as great as in those living along the coasts. There is practically no difference. The man who goes a long ways to seek a cure, who pays a great deal for that cure, will pay more attention to the details in order to bring about that cure than if he had taken treatment at home. If our experience in the Public Health and Marine-Hospital Service is any guide, I will say that we have had a sanatorium in New Mexico for eleven years to which men are sent in great numbers. We have made observations of the patients brought to the

New Mexico Sanatorium, and the surgeon-general and his associates in Washington, after due deliberation, have formulated certain rules for sending men to the sanatorium. One of them is that if a man cannot, by rest in bed, bring his pulse below 100 and his temperature to normal, or, in other words, if he cannot get this effect of rest in his home climate, there is not much use in sending that man to Fort Stanton, and if he has advanced tuberculosis of the larynx or of the intestines, or any of the complications generally recognized as hopeless or desperate, there is no use in sending that man away.

Dr. Frank Billings, Chicago: I cannot offer anything from experience in recent years. Since there has been specialization in tuberculosis, and the whole question has been taken up by specialists, it has deprived us who are engaged in general practice in big cities of the opportunities we formerly had of personal experience clinically, and also deprived us of experience along the line of comparison of climatological with other treatment. Nevertheless, after a good many years of practice, and having had opportunities to visit the different sanatoria or different places where patients are treated climatologically, I think I can say something that is of interest.

It has been my fortune to be able to visit places throughout the West in Colorado, in New Mexico, in Texas, in Arizona, in California, and in the East at Asheville and the Adirondacks, and so on, and during those visits I have been able to see something of the effect of climatological treatment. It has also been my good fortune to be able to see something of the climatological treatment abroad, as in Switzerland, and last year I had the opportunity and interesting experience of visiting the Brompton Hospital, not far from London, England. I think any one who has had the opportunity of observing the treatment of tuberculous patients in these different places must come to the conclusion, first, that while there is much in climate, especially the climate of an arid region with a drier air, a greater amount of sunshine, and for a certain class of patients greater exercise of the respiratory organs than in other places, yet we must conclude that one of the most fundamental things in the improvement of patients in these places is the personal equation of the individuals who care for them. One cannot imagine a climate very much worse than that of England. When we consider the altitude in the vicinity of London, the moisture in the air, and the lack of sunshine, and then visit the Brompton Hospital and see the attitude of the patients toward the superintendent, toward the attendants, and examine the patients suffering from different degrees of tuber-

culosis, see patients that must have had a pyogenic infection clear up, and working in the trenches, short of breath, because of involvement of the cardiovascular apparatus, coughing occasionally, yet apparently free, or nearly so, from tuberculous infection, one is astonished at the great improvement and the remarkable results observed. Again, any one who has visited the various places must have seen the horrible cruelty of the doctors elsewhere, exhibited toward these poor unfortunates who are sent to various climates to be cured, when, as has been stated by others, they have no money with which to buy food. The idea is so preposterous or irrational that we can hardly believe that the members of our profession would be guilty of it. One is made sick at heart to go to some of these places. For instance, go to El Paso and visit the City Square, and see these poor devils sitting around in the sunshine coughing; considered by the residents of the place as so many outcasts, so many people to be feared, without homes, without friends, without food, and expected to get well, and it will make you sick at heart. We are at fault, not only in the West, but in the East, in sending these people there. We are at fault because we do not make the diagnosis, as has been pointed out by Dr. Bonney and others. We must learn to recognize the disease earlier.

The discussion I have heard today is the same as that I heard twenty years ago. There is nothing new that has been brought out. There has been added nothing excepting the experience of such men as Dr. Sachs, Dr. Gray, and Dr. Pettit, who are conducting sanatoria in places until recently considered unfit for the tuberculous. In speaking about climate, you do not add one word more than was told us twenty years ago, and one wonders why that is, and it must be answered in a word, just as has been stated by Dr. Welch, namely, most of you have your experience here. You have not had it elsewhere. Dr. Sachs should take your place and you should take his. So I would sum up the matter in this way: First, we do not know what climate is, and, according to what Dr. Sachs has said, we ought to have a study of this subject in this country which will tell us why Albuquerque, New Mexico, is better than Colorado Springs; why Denver is better than Pueblo; why Tucson, Arizona, is better than southern California, and, in short, tell us why, because you have the opportunity and experience. Then we must study the individual cases, and those who are able to go to a certain climate. If I had tuberculosis tomorrow I would want to go to some one of these places, and I would want the advice of you men who have had enough experience to help me, because I have not enough confidence to be my own doctor, and I should want your help,

and particularly if I had means enough to carry out what you would want me to do. But only such people should be sent to these places who are able to pay for their care. If patients are not able to pay for their own care, it should be done by some fraternal society. For the other class of people who are unable to pay, sanatoria in Iowa, Illinois, Indiana, and other States must be established and carried on. These patients must be treated on general principles. We are charged with sending patients out here who are beyond the possibility of cure. Let me say that you physicians out here sometimes hold patients, whom we send to you in the curable stage, far beyond the period when you ought to hold them. Within a year in this Colorado climate I have known two patients held here until cardiovascular conditions arose because of the high altitude and the long-standing disease, who have suffered the torments of Hell because of dyspnea or air-hunger, and who were kept here until they died. So there are mistakes made on both sides, and very little is to be gained by such a discussion as we have had today unless we get together on it.

Dr. S. A. Knopf, New York: I wish to preface the few remarks I will have to make by quoting a passage from Scripture: "He who has never sinned, let him cast the first stone." We men in the East have sinned in diagnosis, and you men of the West have also sinned; I do not want to say in what way, but you have sinned. If we were to deny the beneficial influence of change of climate in tuberculous cases, it would be unscientific. A change of climate is nearly always good. If I had a patient afflicted with tuberculosis living in an ideal climate and he was not doing well, I would send him to a climate less ideal. I venture to predict that the change would be beneficial to him.

When we are called to select a climate for any patient we must, as my distinguished friend, Dr. Billings, has said, individualize. A man who is born in a cold region will probably never do well in a hot climate, and vice versâ. There are, of course, exceptions to this. It is my practice, before I send a patient to any climatic region, to ask him, "How do you feel in winter?" If he replies, "I am always cold," he goes to a warm climate. On the other hand, if he tells me "I love cold weather, I feel so much better," then I recommend him to go to a cold climate. If he is well-to-do, he can go as far away as he pleases, and if he can afford to go to your beautiful Colorado, where, besides the air being cold, it is also dry and pure, so much the better. We must acknowledge that purity of air is the most valuable adjuvant in the treatment of tuberculosis. Slight changes in climate, but decided changes in environment, are to my mind likewise of great importance.

It is my privilege to be the senior attending physician of the Riverside Sanatorium for Consumptives, where I get my patients from the élite of society from below up. All my patients are poor, and the majority of them come from among the badly housed, overworked, and underfed. But in addition to those who voluntarily enter my service, a goodly number are forced in; that is to say, when investigation by the Health Department has proved that these patients constitute a menace to other members of their families and to their neighbors, they must enter the hospital, whether they wish to or not. Yet these different kinds of patients, coming from the lowest strata of society as far as physical condition and comfort are concerned, do well because of the change from an unsanitary home in the densely crowded district, to the relatively pure air which we have on North Brother Island, where the Riverside Hospital-Sanatorium for Consumptives is located. Even the moisture in the air seems to have no deleterious influence. We have a long waiting list. We rarely have refractory cases, and by isolating a goodly number of centers of infection I believe we do good in spite of our high mortality, which is not high when you consider that all our cases are advanced, and that when they improve we send them to the Otisville Sanatorium, which has superior climatic advantages.

One word more as to sending patients to far-distant health resorts when afflicted with pulmonary tuberculosis. I do believe, as Dr. Billings has said, that it is criminal to send a patient to a far-distant climate when he has not money enough to live at least a year in either a well-equipped sanatorium or in a sanitary boarding-house or hotel, and be under the care and supervision of the local physician.

It was my privilege to have begun my medical career in southern California as an interne in the Los Angeles County Hospital something like twenty-five years ago. To that "City of the Angels" I saw coming hundreds and hundreds of cases, all hoping that the glorious climate of California would suffice to cure them. Some of the well-to-do went to hotels and boarding-houses, led an easy life, had good medical advice, and got well; those who did not get good medical advice and lived carelessly died in spite of their wealth. Those who arrived with little or no means worked when they found work; many did not find work; a goodly number were too far advanced in the disease to be cured, no matter under what conditions The result was that the consumptive wards in the county hospital were constantly overcrowded. It is good to note that there is a happy reaction in the tendency of one community to unload its tuberculous poor upon another one.

What can we in the East do with the thousands of consumptive poor which we have in all large cities? We can only treat and take care of them according to our most modern conception of hygiene and diet, and keep them under constant medical supervision. Diet and careful guidance are most important, and I am willing to admit that if I had to chose between sending a patient to an ideal climate, say Colorado, New Mexico, or southern California, and there letting him do as he pleases, or keep him under constant medical supervision in or near New York, I do believe that he would have a better chance to get well in the East than unwatched and uncared for in the most beautiful climatic resort.

As has been stated by my friend, Dr. Billings, we do not as yet know very much about climate, but we do know that a change is profitable whenever we can give our patients such a change without any hardship to them, and without any hardship to the community. For I reiterate that it is criminal to load off the consumptive poor of the East on a western community. The community should be as well protected as the individual. Let us do our duty as physicians and citizens, recognize the economic condition of the patient and the value of the climates without becoming climatic fanatics or climatic nihilists.

Dr. C. D. Spivak, Denver: I cannot add very much to the scientific discussion of climatology. Since climatology is not a science as yet, at least so far as the influence of altitude open pulmonary diseases is concerned, may I be permitted to make one statement? The physicians of Colorado have not invented Colorado as a place for consumptives. The majority of the physicians of Colorado have come from the eastern States. Many of them—in fact, the majority of them—have come here for their own health or for that of their families. The majority of those who come here get well, and the majority of the eastern physicians who may contract tuberculosis in the future will hie themselves to Colorado. I will venture to say of those who have spoken against the climate of Colorado for tuberculous cases, and maintain that they can treat with just as good results their tuberculous cases at home as at higher altitudes, that if they themselves or their dear ones should contract the disease, they would be ever ready to load them off the very first week, if they have sense enough, to this climate.

Climatology is going to be a science some of these days. We likewise do not know very much as yet about dietetics. We have eaten three meals a day for centuries and centuries, but it is only recently that we commenced to talk in terms of calories. It is the same thing with regard to climate, and here is the point of resemblance: Humanity is groping its way. People did not go

to the physician or dietitian to be instructed what, when, and how much to eat. They were groping in the dark, and they worked out a certain diet for themselves. Every country has worked out its own salvation so far as diet is concerned. So it was with consumptives and Colorado. The consumptives all over this great land have instinctively gravitated toward Colorado. It was by intuition they came here, and not because they were invited. Patients do not come here on account of the recommendation of physicians. They come of their own accord and because of the fact that when their own physician is stricken down with tuberculosis he goes to Colorado. I have evidence to that effect from the newspapers published in Colorado forty years ago, when most of the physicians of that day in Colorado were fakirs and ignoramuses and knew nothing about climate, and yet the town was full of consumptives who came here voluntarily. The reason why the consumptives gravitated to Colorado is the same that prompts animals to abstain from food when they are sick or to find certain herbs for certain ailments. If you could see patients who could not catch their breath, who suffered for three whole days on the cars on their way to Denver, exclaim, just as soon as they struck Denver, "Oh, what a relief!" you would certainly believe that there is some difference in climate, and that the beginning of knowledge is common sense. Once more I wish to emphasize the fact that the Colorado physicians do not invite patients to come here: they do not need to, since the tuberculous of the whole country lift their eyes to the mountains of Colorado, "whence help cometh."

Dr. Gerald B. Webb, Colorado Springs: When time-honored remedies come to be investigated, there is usually found scientific foundation. Patients with tuberculosis have been coming to mountainous regions for over two thousand years. Our mothers poulticed boils. Science has explained the value of such procedure, increasing the flow of blood with its opsonin, etc. Our mothers used the hot mustard foot-bath for colds. We have found the result of this is to cause marrow hyperemia and so leukocytosis.

Dr. Williams and I found an altitude of 6000 feet produced in the blood a lymphocytosis, the lymphocytes being increased some 40 per cent. These cells have been found to be the natural antagonists of the tubercle bacillus. This altitude lymphocytosis we feel scientifically explains, at least in part, the benefit to the tuberculous invalid here.

Dr. A. M. Forster, Colorado Springs: One of the speakers said that patients with laryngeal tuberculosis did not stand this altitude well. I was accustomed, in the East, to look on laryngeal tuberculosis as a hopeless condition, and the cases I saw, as a rule, did very badly at a lower

altitude. I have been surprised at the large number of laryngeal cases apparently cured in a climate like that of Denver.

There are a great many gentlemen, like the doctor from Iowa, who take the results of State sanatoria as a basis for argument against climate. I endeavored, in the body of my paper, to draw a distinction between cases that are treated in the eastern sanatoria and the cases that should be sent to a climate like this with a change in altitude. Everybody admits that it is a crime to send advanced cases of tuberculosis out here and to other places, who have not sufficient money to receive the proper benefits of food and rest, fresh air, in addition to those of climate. It is a crime to send them out to this country, but those are the people who are treated in the local sanatoria in the East. Very few people treated in sanatoria in the East are able to pay more than a pittance. It is a mistake to say that because the majority of cases treated in sanatoria do well, every case should be treated in the East without any change of climate.

In regard to the statement made by Dr. Flick and others, about the incidence of tuberculosis among the native-born population in the Rocky Mountain region, I think it is a serious mistake. I heard a statement made on the other side which I think is just as serious, namely, a patient said that his doctor told him that the inside air in Colorado was better than the outside air in the East. I think such a statement on the part of one of us out here is just as bad as the statement on the part of some man in the East which I have mentioned. Certainly, the natives in Colorado and New Mexico and in the Alps live under the worst possible conditions. Their climate is no different from the inside climate anywhere in the world. The air in a closed room in Colorado is just as bad as it is in a similar place on the sea-coast or anywhere else, and it would not be fair to say that the death-rate was as great among the native born as in the East, because the people live under the same conditions as people live in the East, and in a number of instances they do not have the benefit of climate more than a few hours during the twenty-four.

Dr. Billings stated my position much better than I did myself. We must work out the claims we make for climate, and establish them on a scientific basis. As long as we base these claims on personal experience and on inaccurate statistics, just so long will they be disputed, and we cannot refute the opposite claims justifiably.

I do not care to be understood as apologizing for the men who claim there is no value in climate or altitude.

To disregard the strong evidence of personal experience of those men

living in favorable climate is not justifiable. Our belief in the value of tuberculin is based on ground no more stable. Moreover, the discovery by Webb and Williams that the lymphocytes are definitely increased by coming to higher levels is only one step in the scientific proof of the value of climate and altitude.

In the face of such evidence it is foolish to say that climate and altitude are not factors in the treatment of tuberculosis. And if they are factors, they are important factors, for we know only too well that in fighting this disease no weapon can be neglected.*

Dr. Bonney, Denver: I do not think it wise to prolong this discussion, and I doubt very much if it would be profitable. No matter how long we talk, it would be impossible to convince those who are opposed to climate that there is any value in it. Those who do believe in climate need listen to no further argument. I will, therefore, reply but briefly to one or two things that have been said.

The question has been raised as to the inadvisability of sending patients to health resorts, particularly to high altitudes, for fear they will be unable to return to their homes after they get well. We do not have to consider what we will do with them after they get well; the first proposition is to get them well. It is time enough to consider their future after you have averted impending disaster. Now, a cure is a cure, no matter where it is obtained. It makes no difference whether a patient is cured in one State or another; it is no less a cure from having taken place in Colorado than elsewhere. Referring to the expediency of permitting patients to return home, I can simply say that the vital thought relates to the character of the cases. If you send incipient cases to Colorado, they can be cured. I use the word in its literal interpretation, and when cured can go home. You say you want the patients back. If so, send them early enough so that we can advise their return. If you send your patients here in advanced stages of tuberculosis, the most that you can hope for is to have them stay, and they are mighty lucky if they can stay. If they come here in such condition and secure an arrest, the best they can look forward to is to remain where they are improving. Furthermore, you say you are in the habit of getting patients well at home, and that is what you propose to do.

*Since this paper was presented, Drs. Haldane and Douglass of Oxford, Dr. Henderson of Yale, and Dr. Schneider of Colorado College, forming an expedition to investigate mountain sickness, discovered that at the altitude of Colorado Springs and Pike's Peak the lung-cells themselves actively develop and secrete oxygen, passing it into the blood. This discovery may have much bearing on the question of tuberculosis and altitude.

That is what we are perfectly willing you should do. A large proportion of my patients who came here five or six and ten years ago are now living in the East, and my present clientele is secured directly from them, not from the doctors who are keeping patients at home.

Dr. Billings has called attention to his seeing so many heart-rending spectacles when he visited the various health resorts, the various sanatoria in England, at Brompton, in Switzerland, the Adirondacks, Liberty, Asheville, New Mexico, and Colorado. If it is heart-rending for him to spend a few hours in the observation of this kind of cases in sanatoria, what would it be if he stayed here for fifteen or twenty years and had the privilege of witnessing the kind of cases that are being sent to Colorado?

He said he had not learned anything from this discussion; that we have not brought forward anything that is new; that our attitude is precisely the same as it was twenty years ago. Now, I cannot say in reply that the attitude of the eastern physicians is the same as it was twenty years ago. In my early experience in Colorado the patients came out with instructions to avoid the doctor. They were told before coming to climb the mountains, to ride horseback, to drink whisky, and so on. Physicians who have been privileged to study tuberculous patients, and who have enjoyed clinical facilities for investigation, have become impressed with the necessity of individualization of cases, and the importance of close personal observation. It has followed, naturally, perhaps, that the doctrine of supervision and disciplinary control has been promulgated throughout the country to such an extent that it has become a popular fad. It is characteristic of the American people to approach the extreme, and the dictum has now gone forth from some quarters that a personal supervisory régime is the whole thing, and that climate is of no avail. The tendency has been to vary from one swing of the pendulum to the other. However, I do not agree with the statements that one gentleman has made, to the effect that climate is of supreme consideration. Far from it. It is only a valuable aid or adjuvant.

No physician in Colorado or elsewhere is justified in attributing an undue importance to climate. If, upon the basis of the physical condition, it is apparent that the change to Colorado is wise, and if the climatic conditions are appropriate for the individual, a clear statement to this effect should be made to the patient. After he has been so informed, it should be stated in the same breath that coming to Colorado *per se* offers very little, that the best results from climatic change are obtained only in conjunction with a suitable method of living and appropriate management.

It is not so much *where* one lives, but *how*. If a properly regulated supervision at home, in damp, moist regions, is good, the same careful supervision plus a suitable climate is better. If good results are obtained today in unfavorable localities through the influence of rest, outdoor living, superalimentation, etc., it is obviously wise for the patient to be in that locality which will permit of the most complete fulfilment of these cardinal principles of treatment.

I feel that I have talked too long already; I am sorry to be responsible for having this discussion started in presenting my paper. It has not been my idea so much to institute any controversy with reference to climate, but to point out what seem to me to be important tendencies of the profession with reference to the management and diagnosis of this disease. I submit that a man is justified in forming his conclusions solely upon the basis of his own personal observations. If his clinical facilities are such that, upon an analysis of his cases, he finds one-quarter of the number to be without tangible evidence of the disease, although having been subjected to hardship, separation from family, business sacrifices, etc., and a very large number compelled to journey long distances, so far advanced as to be practically hopeless, with a comparatively small proportion arriving in Colorado in the incipient stage, it is perhaps worth while to make mention of these facts in order that we may profit from a study of such an experience. We make mistakes here the same as physicians do elsewhere.

I fully agree with Dr. Billings' contention that cardiac and renal disturbances frequently—I will not say occasionally, but frequently—are overlooked, and that we often fail to recognize the indications for a prompt change to lower altitudes.

THE ALBUMIN REACTION IN THE SPUTUM IN PULMONARY TUBERCULOSIS

By Lawrason Brown, M.D., and W. H. Ross, M.D.

Saranac Lake

The great simplicity of the albumin reaction in the sputum, brought into notice in 1909 by Roger, and the claim that while it occurs almost constantly in pulmonary tuberculosis it is absent in bronchitis, make it highly desirable that the question should be definitely settled. This paper deals with the occurrence of the test in cases of pulmonary tuberculosis.

Collection of Sputum.—The sputum should be collected with the same care that is exercised in connection with specimens intended for examination for tubercle bacilli. It must come from below the glottis, and may be controlled by a microscopic examination of the cells. Blood in the sputum may vitiate the test, and particles of food have a similar tendency. The sputum must be fresh, as decomposition renders it unfit for the test, by splitting up the mucin.

Saliva contains a small amount of protein, and often reacts to the test for albumin. The saliva of some healthy individuals, however, reacts very faintly, and in one instance under our notice not at all. In five tuberculous patients the saliva was positive in four and doubtful in one, whose sputum gave a marked reaction, while the sputum of the others gave a very marked reaction. Potassium ferrocyanid, Esbach's reagent, and excess of a saturated solution of sodium chlorid were employed in these tests.

It is unquestionably wise to exclude as much saliva as possible, but it may reasonably be doubted if saliva ever produces a positive reaction in a negative sputum when carefully collected. It is possible that a severe stomatitis may cause confusion.

Technic of Test.—The sputum, preferably collected in a wide-mouthed bottle, is diluted with an equal quantity of distilled water (tap-water is used by some) and thoroughly shaken or stirred. A 3 to 10 per cent. solution of acetic acid is carefully added, drop by drop, until the muco-

purulent particles, if present, seem to collect into a mass, leaving the surrounding fluid clear. The sputum is then filtered through paper into a test-tube. When the mucin is properly coagulated, the sputum is very easily filtered. Some specimens require a considerable amount of acetic acid. A drop of the acetic acid is added to the filtrate to see if all the mucus has been precipitated. If it remains clear, a few drops of a saturated solution of sodium chlorid are added if heat is applied, or one of the ordinary tests for albumin in sputum is used without the addition of the salt solution. In our cases we have added an excess of the saturated solution of sodium chlorid, and in practically every instance obtained cloudiness where a positive test for albumin was obtained by any other method.

The positive reactions can be divided into slight (+), marked (++), and very marked (+++), according to the amount of albumin present.

SUMMARY OF RESULTS IN PULMONARY TUBERCULOSIS

The results obtained up to May, 1911, have been well summarized by Roger and Lévy-Valenski, who collected 1374 cases, of which only 76 were negative. Among these 76 negative cases were 25 improved or cured patients, 29 suspected individuals, 13 patients with early tuberculosis, 4 with more advanced, and 3 with acute miliary tuberculosis. The figures indicate that over 98 per cent. of all cases (1185) of confirmed pulmonary tuberculosis react positively; that acute caseous tuberculosis (10 cases) always react; that acute miliary tuberculosis may fail to react in the majority of instances (3 out of 4); that the test may disappear after the patient has been considered cured for two years (4 cases); that the test may be positive only during a positive tuberculin reaction.

SUMMARY OF RESULTS IN OTHER DISEASES

The occurrence of the test in diseases other than pulmonary tuberculosis has been discussed in a thesis by E. S. Rabinowitsch (Montpellier, 1911). Positive reactions were obtained in 20 out of 21 cases of pleurisy (with effusion), in all cases of pneumonia and bronchopneumonia, of active pulmonary congestion, and of acute pulmonary infections, usually in pulmonary gangrene (2 out of 3 cases), in 1 out of 2 cases of pulmonary cancer, and in cases of bronchitis due directly to cardiac or renal lesions.

Negative reactions occur in bronchitis, either acute or chronic, with or without emphysema, and in lues of the lung or pleura.

These observations would tend to uphold the contention that in practically all cases of pulmonary tuberculosis the test is positive, and that in all simple non-inflammatory conditions of the lung it is negative.

THE PROGNOSTIC VALUE OF SERUM-ALBUMIN AND GLOBULIN IN THE SPUTUM

The forms of protein in the sputum are serum-albumin and globulin, which some (Roger, Wourmann, Smolizanski) have attempted to separate and estimate. The technic usually employed, without going into detail, is to precipitate the globulin from the neutralized solution with ammonium sulphate, to filter, and then to weigh it. The filtrate is acidulated with acetic acid, and the serum-albumin coagulated by heat. It is then filtered off and weighed. From 11 observations Smolizanski found the globulin to form 8 to 87 per cent., and the serum-albumin from 12 to 91 per cent., of the total albumin. An excess of globulin is favorable, while an excess of serum-albumin occurs usually in patients with fever, emaciation, night-sweats, and an advancing process.

Comparisons have been made between the albumin reaction and the intradermic tuberculin test in 67 patients by Chapel. All reacted positively to the former, while 4 cachectic patients failed to react to the latter.

RESULTS OBTAINED AT THE ADIRONDACK COTTAGE SANATORIUM

The albumin test was applied to 116 cases, and in many instances was applied a number of times. Contrary to the experience of some observers, we have found that one test gives very inconclusive evidence of the absence or presence of albumin in the sputum. In 4 cases a positive reaction was obtained after a previous negative reaction. One of these at no time had any tubercle bacilli, and to the four tests responded negatively, negatively, doubtfully, positively. The other three had open lesions at some time, and the test was positive after one negative test. The first patient, a trained nurse, was exceedingly nervous, had more or less temperature, extensive physical signs in the lungs, and after one negative test responded twice with a slight positive reaction. The second patient had been taking tuberculin for a number of months: no tubercle bacilli had been found for four months, and he was well enough to work half a day. After one negative test he responded once positively. The third patient, a physician, presented few,

if any, physical signs, and the test, applied about three months after tubercle bacilli were found only once in the sputum, was negative three times, and slightly positive once.

INCIPIENT CASES

Among 21 incipient cases there were 5 with closed lesions. Of these, 3 reacted markedly to the test, and all showed a positive cutaneous tuberculin reaction. One who reacted markedly to the cutaneous test reacted doubtfully to the albumin test, but was very susceptible to tuberculin. The fifth, a male, presented a marked positive cutaneous tuberculin reaction, but had no physical signs, and the diagnosis of clinical tuberculosis was doubtful. He had a nephritis with 0.3 per cent. of albumin in the urine, which, when injected into a guinea-pig, produced no tuberculosis. But one test was made in this patient. Among the 16 patients with an open lesion, in 8 tubercle bacilli had been found some time previous to the albumin test. Of these, 1 reacted markedly, 1 gave a positive reaction after 3 negative reactions, 1 gave a slight, 4 a marked, and 1 a very marked, reaction. Of the 8 cases who had tubercle bacilli in their sputum at the time of the test, 6 reacted markedly and 2 very markedly. All 8 patients reacted to the cutaneous test.

MODERATELY ADVANCED CASES

Among the 90 moderately advanced cases on whom the albumin test was tried, 18 were closed cases, all of whom reacted to the cutaneous tuberculin test. Three of them gave a slight reaction, and 15 a marked reaction, to the albumin test. One patient from whose sputum tubercle bacilli had disappeared during residence failed after one test to show the albumin reaction. In 15 patients in whose sputum tubercle bacilli had been previously found 1 reacted negatively (only one test), another positively after a primary negative reaction, 12 reacted markedly, and 1 very markedly. Among 57 patients who had tubercle bacilli in their sputum at the time of the test 4 reacted slightly, 35 markedly, and 18 very markedly.

FAR-ADVANCED CASES

The test was applied to 5 far-advanced cases. Of these, 3 reacted markedly, 2 of whom had signs of cavitation and slight fever, and 1 no definite signs of cavitation and marked fever. The other 2 reacted very markedly,

1 of whom was a quiescent fibroid case of seventeen years' standing; the other a patient with slightly advancing disease.

In all of 116 cases 4 reacted negatively, 1 doubtfully, and 111 (96 per cent.) positively.

Among a number of cases in whom a diagnosis of pulmonary tuberculosis could not be made may be mentioned first a case of pulmonary abscess which gave a marked reaction. A second case, a patient convalescing from pneumonia, gave a very marked reaction, and another, who had accompanied her sister to Saranac Lake and had had no symptoms except clearing of the throat, gave a marked reaction. A fourth patient, who presented no signs or symptoms of tuberculosis, gave a marked reaction, though this might in part be due to some decomposition of the sputum, while in the fifth patient the question was between pulmonary tuberculosis and bronchitis. The patient presented physical signs at one apex, but other physicians scouted the idea that she had tuberculosis, although the test in this case was markedly positive. The patient is at present at work. A sixth patient with extensive physical signs but no tubercle bacilli in his sputum at any time gave a marked reaction. This patient had reacted to the Wassermann test and had received one dose of salvarsan. The seventh patient, who reacted positively to the Wassermann test, failed to react to the skin test, but gave a marked albumin reaction.

CONCLUSIONS

All patients with tubercle bacilli in the sputum react positively to the albumin test in the sputum.

During acute pulmonary exacerbations the test may appear for the first time or become more pronounced.

The degree of reaction is, as a rule, proportional to the stage of the disease —slight in the early stage, marked in the late.

The test in no way parallels the tuberculin tests in revealing tuberculous infection.

A positive reaction by itself is of little diagnostic value.

When the reaction is repeatedly negative in a patient without symptoms of acute miliary tuberculosis, it is probable that no active pulmonary tuberculosis is present.

The great simplicity of the test and the fact that it can be applied to the same specimen which is to be examined for tubercle bacilli strongly recommend it.

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SPUTUM EXAMINATION, WITH SPECIAL REFERENCE TO THE ANTIFORMIN METHOD

By Frederick Tice, M.D.

Chicago

To obtain the best results, the sanatorium treatment of tuberculosis has conclusively demonstrated, among other things, the absolute necessity of an early diagnosis. This has created a demand, on the part of the clinician, for some means by which he can readily and positively detect the disease. Although, for the experienced clinician, certain symptoms and physical signs are highly suggestive or even positive, too often the incipient and occasionally the moderately advanced case is not detected. In this class of cases tuberculin is of but comparatively little service, because of the questionable advisability of the subcutaneous use, in diagnostic quantities, and because of the extreme difficulty of interpreting the local relations, except in children. To make a tuberculin test the sole criterion on which to base a diagnosis is misleading, but should always be considered in conjunction with the clinical symptoms and physical signs. To determine and properly interpret the physical findings, particularly in the early stages, is not always an easy matter, and, as a result, a sputum examination is resorted to as a means of diagnosis. When possible, the diagnosis should be made while the process is still "closed," with no bacilli in the sputum, but it is unquestionably true that many cases of "open" tuberculosis should be detected much earlier than is usually done. The usual direct methods of sputum examination are not satisfactory, partly on account of the small amount of sputum, the limited number of bacilli, the uncertainty of selecting the bacilli containing particles, and the time required in the search for the bacilli. To obviate some of these difficulties numerous liquefying and digestive methods have been suggested, some of which are fairly satisfactory. The ideal method must possess the following requisites:

1. That it must be comparatively simple and easily executed.

2. Capable of liquefying the sputum, liberating and concentrating the bacilli.

3. The power of devitalizing the bacilli without destroying their staining properties.

4. Comparatively quick, certain, and with better results than the older methods.

Several methods for sputum examination have recently been suggested, among which is the antiformin method of Uhlenhuth.[1] Antiformin[2] is described as "a strongly alkaline solution of sodium hypochlorite, equivalent to 5.68 gm. available chlorin; sodium hydroxid, 7.8 gm., and sodium carbonate, 0.32 gm." The substance was introduced in 1900 by Victor Tornell and Axel Sjoo, of Stockholm, and used for cleaning beer-vats. Owing to its active solvent and oxidizing properties, Uhlenhuth found it was of service in sputum examinations. When properly diluted and mixed with sputum, it produces liquefaction and destroys the insoluble substances of the sputum, as well as all bacteria, except those that are acid fast, the staining qualities and vitality of which remain unchanged. The antiformin method, as proposed by Uhlenhuth,[1] is as follows:

1. Mix the sputum with an equal volume of 20 per cent. aqueous solution of antiformin.

2. Place mixture in a Petri dish, stirring or agitating occasionally until homogenized, which occurs in fifteen to thirty minutes.

3. Centrifuge for thirty minutes.

4. Decant supernatant fluid.

5. Wash precipitate twice with normal salt solution.

6. Remove entire or part of the precipitate, fix, and stain in usual manner.

Instead of a 20 per cent. antiformin solution, a weaker dilution may be employed, and the mixture incubated for twenty-four hours. It is evident, of course, that the greater the amount of sputum employed, the greater the probability of detecting the bacilli.

Seeman[3] has found this method of service in detecting tubercle bacilli in feces, pus, blood, and exudates, while Brem[4] employed it in the examination of milk from a cow with a tubercular udder. Lagréze,[5] Thilenius,[6] Hoffmann,[7] C. Hart, and O. Lessing[8] report its use in detecting the bacilli in the tissues.

A comparative study was made of the results obtained by the antiformin and Ziehl-Neelsen methods in the examination of the sputum of 50 patients with moderately or far-advanced tuberculosis. All were positive to the usual method, while in four with the antiformin no bacilli could be found, even after a prolonged and faithful search. In about 30 per cent. of the slides the average number of the bacilli was slightly increased, but in the

remainder there was no appreciable change. So far as could be determined, the antiformin was of but little assistance in the direct examination of the sputum, certainly not commensurate with the added increase in the technic. As a means of direct examination it must be inferred, judging from the number of modifications, suggested by Koslow,[9] Loeffler,[10] Hüne,[11] Polugorodnik,[12] Bernhard,[13] Lorenz,[14] and others, that the antiformin method has not proved entirely satisfactory.

Hoping some one of the modifications might be more serviceable, those of Koslow[9] and Loeffler[10] were employed.

The ether-acetone-antiformin method of Koslow is as follows:

1. The sputum and antiformin are thoroughly mixed by shaking for about five minutes. If the sputum is thick, an equal volume of antiformin is used; if thin, about one-half of the quantity.

2. Dilute this mixture with distilled water in the proportion of 10 c.c. of water to each cubic centimeter of antiformin.

3. Add a solution of equal parts of ether and acetone, equivalent to the amount of distilled water.

4. The mixture is then shaken for two or three seconds and then set aside to precipitate. In a few seconds the mixture will separate into three layers, the bacilli being deposited in the middle layer.

5. A portion of this layer is then pipeted, fixed, and stained.

For the layer formation, it is necessary that a sufficient quantity of water be added, so that the antiformin does not exceed 7 or 8 per cent.

The chloroform-antiformin method of Loeffler is as follows:

1. Equal quantities of sputum and a 50 per cent. aqueous solution of antiformin are mixed and boiled, which produces a rapid liquefaction.

2. To each 10 c.c. of the mixture add 1.5 c.c. of a 10 per cent. alcoholic solution of chloroform. The chloroform, by emulsifying, liberates the bacilli from the fats and waxy materials.

3. Centrifuge for about fifteen minutes.

4. The bacilli are contained in the disc which forms on the surface of the chloroform.

5. A portion of this disc is then pipeted, fixed with egg-albumen, and stained.

Each of these modifications were tried in ten additional examinations, but without any improvement over the regular antiformin method.

The rather unfavorable experience with the antiformin method and some of the modifications led to a trial of the Ellermann-Erlandsen,[15] so-called Doppel, method, which is as follows:

1. The sputum, in a test-tube or glass cylinder, is thoroughly shaken with one-half its volume of a 0.6 per cent. Na_2CO_3 solution.

2. Mixture is then incubated for twenty-four hours.

3. Pour off supernatant fluid, centrifuge the sediment, and pour off the remaining fluid.

4. To the sediment add 2 to 4 volumes of a 0.25 per cent. NaOH solution, and heat to boiling, while stirring.

5. Again centrifuge, and make smears from the sediment; fix and stain in usual manner.

This method is simple, easy of execution, no difficulty being encountered in fixing the smears, and the results far surpass those obtained by any other method. Compared with the ordinary Ziehl-Neelsen and antiformin methods, the bacilli are five to twenty times more numerous, which findings agree with those of Jorgensen and Herzfeld.[16]

The only possible objection is the time element,—the twenty-four hours required for incubating,—but in the doubtful and questionable cases, where it is of the greatest service, this is really not worthy of consideration. The results, by this method, have been so satisfactory that all others have been discarded, and it has been adopted as a part of the routine laboratory work.

From the foregoing considerations the following deductions appear justifiable:

1. The antiformin method of examining the sputum does not fulfil the requirements.

2. As a routine method it is not satisfactory, but may be of service in selected cases, particularly in tissue and bacteriologic work.

3. The Doppel method of Ellermann-Erlandsen has given the most gratifying results in the direct examination of the sputum.

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12. Beit. z. klin. d. Tuber., Würzburg, 1911, vol. xviii, No. 1.
13. Med. Klin., Berlin, Jan. 22, 1911, vol. vii, No. 4.
14. Berlin. klin. Woch., Jan. 16, 1911, vol. xlviii, No. 3.
15. Hospitalstidende, 1908, Nos. 17, 18, 30.
16. Zeitschr. f. Hyg. u. Infectionskr., 1910, vol. lxvi, pp. 315, 336.

DISCUSSION ON DR. TICE'S PAPER

Dr. John Ritter, Chicago: As to the antiformin method, I have had some experience with it. For years I have made use of what is known as the Boston method of treating the sputum; namely, agitating it with a 2 per cent. carbolic acid solution, and staining it in the usual way. When the antiformin method was first advocated I tried it, was much impressed with it, and advised its use, and after making quite a number of examinations of sputum with success, I occasionally came across specimens of sputa in which I found no bacilli, but the physical signs clinically showed undoubted tuberculosis. I then fell back on the old method—the Boston method—and found tubercle bacilli, since which I have discontinued the antiformin method entirely.

Dr. Theodore B. Sachs, Chicago: The paper by Dr. Tice takes up the important subject of efficient and simple procedure for the detection of tubercle bacilli in the sputum. The introduction by laboratory workers, in recent years, of various modifications in the technic of sputum examination, points to the ultimate elaboration of such a procedure. The antiformin sedimentation method is at present in use in various sanatoria. . At the Edward Sanatorium, Naperville, Illinois, during the last few months, this method was employed in 107 specimens of sputum, in which no tubercle bacilli were found with the old method of selecting from sputum a suspicious particle for examination.

The results were as follows: 107 specimens, with the old method, no tubercle bacilli found. Same specimens, with antiformin sedimentation method, tubercle bacilli found in 13 specimens, or 12 per cent. Demonstration of elastic fibers in the sputum facilitated by the use of the new method.

The technic followed by Dr. Anne Murphy, one of our resident physicians, was as follows: 5 c.c. of fresh sputum and 5 c.c. of water shaken with 2 c.c. of antiformin; after shaking well for five to ten minutes the test-tubes are left standing for twenty-four hours. At the end of twenty-four hours they are put in centrifuge, and contents thoroughly sedimented; the supernatant fluid is then poured off and replaced by equal amount of normal salt solution, and shaken well again; again sedimented. After washing two or three times thoroughly, the supernatant fluid is poured off, and even smears are made with platinum loop from the sediment. To examine for elastic fibers: Make smears in the same way from sediment and stain for one-half minute with gentian-violet. Examine with the

low power. Unstained specimens may be examined in the same way by low power by turning off part of the light to the lens.

Dr. Wm. A. Walters, Billings, Mont.: I find that the examination of sputum, as made by the general practitioner, is frequently done in a misguided way. Quite often our general practitioners have upon their shelves a carbol-fuchsin solution which is entirely precipitated and worthless as a staining medium. Carbol-fuchsin as ordinarily made will precipitate and be good for nothing in two months' time. Not long since Czaplewsky came out with a formula which can be found in Sahli's "Diagnostic Methods," in which he adds glycerin to the carbol-fuchsin solution. The use of glycerin keeps the carbol-fuchsin solution from precipitating, and once you have made the solution, it is good forever. I have made a slight modification of this solution, which in my hands I believe works better than the original. To begin with the fuchsin cystals, one should be careful to specify fuchsin for bacteria: the so-called acid fuchsin, or "sauer" fuchsin, is for tissues, and will not stain bacteria. I have been mistaken in having that material sent to me in place of the fuchsin for bacteria.

The formula that I have used successfully is as follows: Fuchsin crystals, 1.5 grams; alcohol (95 per cent.), 15 c.c.; carbolic acid crystals, 7.5 grams; mix and dissolve by heating gently and add glycerin 50 c.c. and distilled water 100 c.c. This will not precipitate.

Another thing to be noted is with reference to the staining of the slide. It is commonly the practice to apply the stain cold, and apply the heat from below by holding the slide over a Bunsen burner or an alcohol lamp until the stain boils. This is a mistake, because it precipitates the stain on the slide. The fuchsin solution should be heated in an old spoon, and, while boiling, poured on the slide. It should stand for several minutes, when it can be decolorized. Here is another point that has been helpful to me, and that is to counterstain only half the slide, so that in examining under the microscope one has the counterstained portion in which to look for the secondary organisms and the decolorized portion in which to hunt for the tubercle bacillus. It has often been the case that I have found the tubercle bacillus in the decolorized part of the slide very readily, and been unable to find it in the counterstained part of the slide. A single bacillus is often obscured by a deeply stained mass of débris lying directly upon it, whereas if this mass of débris is not counterstained with the blue, the bacillus is readily visible.

The introduction of this antiformin method of examining for the tubercle bacillus which Dr. Tice describes is going to be greatly helpful to the

general practitioner. In the health department laboratories of Chicago they have used the sodium hydroxid centrifugal method, with the result that the bacillus is more frequently found than before this method was employed.

Dr. Frederick Tice, Chicago: I wish simply to say that the work included in this particular communication does not include all our observations. The antiformin method was first applied shortly after Uhlenhuth's original communication. At that time we were engaged in following up the work of Rosenberger with reference to blood examinations or tests in the diagnosis of tuberculosis, and, not meeting with success, it occurred to us independently, from subsequent suggestions, that we might treat the blood with the antiformin solution, exactly in the same manner as Uhlenhuth had suggested for the sputum. This we did in a few instances without recovering the organism in a single instance. It was the rule in the laboratory for a number of weeks to examine the sputum by the antiformin method, but one after another the assistants became discouraged, and the method was finally dropped. We also applied it to pleural and peritoneal exudates, where the clinical diagnosis was tuberculosis, but without success. Subsequently, we again took up the method on account of the favorable results. It is true, in the majority of cases, that the diagnosis should be made before the tubercle bacillus appears in the sputum, but even with experienced clinicians how often it occurs, after a most careful physical examination, that resort is made to a sputum examination.

This being true, some improved method must be of assistance not only to the experienced clinician, but to the general practitioner—the one who must make the majority of diagnoses in cases of tuberculosis. Our experience is this, that with the so-called double method—Ellermann-Erlandsen method—we have met with very exceptional success, and we would urge that this method be given a fair trial and due consideration.

BEDSIDE SERVICE IN TUBERCULOSIS

By William Porter, M.D.

St. Louis

It was the morning before the great battle. Although outranking his royal leader in age and experience, the veteran of Bohemia touched his knightly crest and said, "I serve." He sealed his fealty with his blood, but from that day, throughout all the struggles and victories of five hundred years, *Ich dien* stands written on the crest of the Prince of Wales. I have chosen this motto because of its fitness in a longer and more costly campaign. In this great crusade, of more importance to christendom than armies, navies, or conflict of force, personal service of the highest order is called for, and the answer to this call from loyal hearts will bring a victory more lasting than that of Crecy. The most popular and, in a general sense, the most important study of tuberculosis is that which has to do with its limitation and prevention. The long array of facts and deductions concerning its history, prevalence, and vital and economic cost have led to splendid organized work, general at first, but now reaching into hamlet, county, and town, with effective action already telling for good in those countries where leadership in science is best recognized. This is ideal work—work which by its very conditions brings men closer and teaches brotherhood and responsibility, showing, through careful investigation, the needs of the many as they have never been shown before.

But it is of another phase of this conflict that I would speak. Not where, in organized effort and in the light of public interest, work brings grateful recognition, but where, face to face with the victim, the physician meets the problem of personal service—not always with the hope of cure, but always with the thought of care. No longer may he deem his duty done when, having forecast the prognosis, he prescribes by routine or shifts the scene and his responsibility to "another and perhaps a better climate." His duty is to take each case as a sacred trust; to study the individuality and the symptoms as a careful attorney studies each link in the evidence; to take an inventory of what is left of vitality, assimilation, and tendency to repair; to combat each complication and meet each advance. Tubercu-

losis is not only communicable and preventable, but it is curable. If not in all cases curable, it is always amenable to intelligent care. Who would abandon a case of cardiac lesion or of cancer because the terminations are generally fatal. Yet the average case of tuberculosis is by far more hopeful than these.

I desire to speak definitely of some of the special conditions which must be understood and cared for if we would achieve even partial success in this service. No attempt will be made to cover the entire field, for the manifestations and complications of tuberculosis are legion, but I want to urge some practical points which have become with me part of the daily application of means to an end. Some of these are not dwelt on in our text-books, yet I ask for them a fair judgment and an honest trial.

First of all, I insist that the physician must, so far as he can, fit himself for the recognition and interpretation of the early evidences of tuberculosis. If we are to be of those who are restoring infected cases, we must discover the infection early. I do not mean that every physician can become an expert diagnostician in incipient tuberculosis,—few, if any, attain to that,—but I do mean that he should cultivate the habit of close observation, study the normal sounds (in his own chest, for instance), so that he can detect at once the abnormal, apply carefully the methods of physical diagnosis to each case, watch the temperature, note the change in function, bear in mind the occupation, daily habits, hygiene of surroundings, and opportunity for communication. Except in the second and last stages, the evidences of tuberculosis are indefinite, uncertain, and irregular. The deep-seated lesion of limited extent may show few physical signs, and the microscope be not yet positive—yet the evidence of toxemia be fairly plain to him who can interpret.

In order that this paper may have a practical bearing in personal work, I want to note a few of the symptom evidences of incipient tuberculosis to which I believe attention has not been sufficiently called. Then some of the physical signs which I have found of importance, not catalogued among the common and ordinary signs, and, lastly, a few practical therapeutic suggestions which have proved of value in combating obstinate conditions at the bedside. I will attempt to follow the mention of the special evidences and physical signs with a mention of therapeutic agents of special application, and to avoid discussion of what is more commonly agreed upon.

Symptom Indications

The symptom indications are suggestive, rather than positive. Very early there is VASOMOTOR INABILITY. Whether this is cause or effect in relation

to alimentary disturbances is a question. It certainly is part of a vicious circle, of which poor digestion, malassimilation, changed hemic conditions and nerve function are segments. It is shown in the flushed cheek, one rather than both, and that often the affected side. Sir Andrew Clark, that most accomplished clinician and teacher, used often to note the frequency of this symptom in such cases. Unilateral mydriasis as a result of sympathetic irritation may be due to apex pulmonary tuberculosis of the corresponding side, or possibly to reflex irritability of the vagus from bronchial gland infection near the lung attachment. The dilated pupil and hectic flush of the same side, though not always present, are worth looking for. This sympathetic irritation, whether caused by a local change and continuity or by a resultant toxemia, is also productive of change in character and rhythm of the pulse. I would not argue this almost self-evident proposition, but simply call attention to the feeble cardiac impulse, the accentuated pulmonic second sound, and the small, easily compressed, and sometimes rapid pulse, the character and rhythm of which are not markedly affected by change in position. The phenomenon of night-sweating is probably due to disturbance of this part of the nerve system, which hypothesis has suggested a therapeutic point to be after referred to.

Fever is often one of the earliest symptoms. A slight afternoon rise, especially if the morning temperature be subnormal, is always suggestive. A very slight increase, if continued and unchanged by a malarial test, must not be ignored. Louis long since pointed out that the fever starts in a third of the cases at the same time or even before the proof of local lesion. There may be absorption of tuberculosis when the local infection is so small or so deep rooted that it cannot be detached, and where the bacilli are not yet thrown off. It has been demonstrated that the afternoon fever may in part be due to autoinfection from retention in the ascending colon, and that a high flush, repeated daily for some days, may cause marked reduction. Time prevents following this topic further, except as will be noted under therapeutic suggestions.

Cough is neither a constant nor a characteristic symptom of early tuberculosis. It may be due to local irritation, either reflex or direct, in the pharynx. It is often accented by the afternoon increase in pulse and temperature. There may be little or no expectoration, except such as is usually found in dwellers in cities or in those who have a slight catarrh, showing no definite constituency under the microscope until after the closed stage.

Hoarseness is sometimes present where there is an early tendency to laryngeal complication. I have found it more or less marked in 12 per cent.,

and in all of these cases the laryngeal complication was secondary. In some cases aphonia is present where there is no laryngoscopic evidence of laryngeal involvement except a lessening of adductor and tensor function. In these cases there is probably pressure on the recurrent laryngeal nerve, as in aneurysm.

Hemoptysis may be the first recognized evidence of tuberculosis, although the case has probably passed the stage of incipiency. In the early cases it may be palliative, where there has been local stasis or congestion due to invasion of the perivascular lymph-channels, or inflammatory reaction may so obstruct the bronchial blood-supply as to induce dilatation of the right ventricle, which, with diminished vasomotor force before referred to, may lead to overdistention and temporary relief by hemorrhage. In the latter stages necrosis penetrating a blood-vessel or the well-known cavity aneurysm with feeble wall are the more frequent causes. In private practice among 320 incipient cases hemoptysis has been an early symptom in a little over 8 per cent., while in hospital experience, where all stages are admitted, in 1400 cases there was hemorrhage in 25 per cent.

Symptoms founded upon CHANGE OF FUNCTION AND PATHOLOGIC CONDITIONS IN THE ALIMENTARY TRACT are most important in the study of tuberculosis from the viewpoint of etiology or of symptom-reading and therapeutics. Gross pathologic lesions are common in the advanced stages, but there are conditions of gastric and intestinal origin in many early cases. Poor appetite as a result of impaired gastric function, limited or changed secretion, intestinal fermentation, and consequent distention are all possibly links-in-the-chain symptoms, but they are also interdependent. The most valuable lesson which this line of study has brought to me is the recognition of the frequency and results of fecal retention in the ascending colon.

In last year's Harvey Society Lecture on "The Common Bacterial Infection of the Digestive Tract and the Intoxications Arising Therefrom," Dr. Harter says: "In man there is in the ileum, within a foot or two of the colon, a marked increase in the number of bacteria and of their varieties. In the large intestine we find the most dense accumulation of bacteria, less in variety than in the ileum, but their numbers in excess."

Without asking the time for detailed reports published elsewhere, let me say briefly that it has been proved that the scybalous masses frequently found in this part of the bowel may contain bacilli. Whether these are invaders through the medium of food or "natural born," coming from other organs in the same individual, may be a question, but that the removal of these masses by the enema and the after-use of the normal salt flush not

only encourages assimilation, but reduces the evening temperature, intercurrent diarrhea, and other evidences of autoinfection, is with me an accepted fact.

Physical Signs

The study and correct interpretation of the physical evidences of incipient tuberculosis demand our best thought. If I were asked what is most necessary in physical diagnosis, I would unhesitatingly say a better understanding and appreciation of methods now employed. I would not decry recent advances, nor retard the enthusiastic delver in the laboratory and postmortem room. We need them more every day. I do say, however, that what is demanded just now, more than anything else, is the careful, painstaking, conscientious interrogation by physical methods, theoretically known and approved by all of us, yet also sadly neglected by many.

In making a physical examination let us bear in mind the pathologic changes indicated, their sequence, and, as far as possible, their stage. Through the physical signs we bring to light the secrets of the hidden foe. The initial lesion is often found just below the apex on the right side. This part of the lung and the bronchus supplying it are not so well developed as are other parts, and the functional movements are feebler.

Chest Measurements.—I would take this opportunity to protest against the use of the ordinary tape as an instrument of precision in chest examinations. The direction of chest movement precludes exactness by measuring around the chest, while individual tact and schooling may enable a tubercular subject to make a better showing than another who is healthy. The most effective method of mensuration is by large calipers placed on corresponding points, the chest diameter and anteroposterior movements of each side being noted in the registration scale.

The "thoracic perimeter," interesting, if not very valuable, is obtained by adding the chest circumference at forced expiration to the circumference at forced inspiration. The sum should at least equal the height of the individual. Half the sum is the "thoracic perimeter" (Loomis).

Let me here interline a word in favor of the blue pencil, not as an instrument of precision, but as an evidence of it. While gross lesions may be located and remembered, the minute changes and additions in the incipient case easily pass from sight and hearing unless well outlined and fixed. When all is done, a record is easily made on a skeleton chart for reference and filing.

Palpation and percussion do not, as a rule, give very definite results in early stages. Strong percussion should be avoided. Sometimes there is a

sudden retraction below one apex when light, sharp percussion is made, and at times even in very early cases there is a perceptible difference where careful percussion is made of corresponding pulmonary regions. To the trained touch much evidence may be gained, as suggested, by recent studies in muscle rigidity. When the active pathologic processes are found in the lung, there are certain definite signs. Some of these I wish to cite. One of the earliest signs of localized disease in the lung is muscle tension of the corresponding side. I am not sure but that this phenomenon is found in active pulmonary disease other than tuberculosis, but certain it is that it is well worth study. We have long known that muscle tension has value in acute abdominal inflammations and in some reflexes of the extremities. It is surprising how delicate is the response in many cases. Since Dr. Pottenger first called my attention to this sign I have found it in the majority of all incipient cases. Recently, at the State Sanatorium, I examined a number of patients whose clinical history I did not know. With my eyes closed that I might not be influenced except by touch, I was astonished to see how accurate the evidence was, not in the advanced cases so much, but in the early cases, where the pathology is in its beginning and the ordinary interrogations are inadequate.

To estimate and locate this tension the finger-tips should be placed lightly on either side. The upper third of the anterior chest-wall gives the best result, and it is necessary that the touch should be over the intercostal spaces. So far as I have been able to tell, the site of tension corresponds with the affected areas underneath, and this phenomenon may be found in other cases than those of tuberculous infection. Recently I found it well marked in a case of acute myocarditis. There are two divisions of this most interesting subject—(*a*) marked rigidity, due probably to reflex stimulation; (*b*) those of more chronic type, where the reflex is wanting. In these cases this sign depends upon our ability to note the difference between tissues of different density, even when lying within the hollow cavities of the body, by extremely delicate palpation.

Auscultation.—It is from auscultation that we obtain our most valuable results. The earliest change in the respiratory murmur is a slightly diminished and roughened sound that is found where small elevations of tubercular processes make the surface of the bronchiole uneven. It precedes the crepitant râle of the vesicle, as a rule, and must not be confounded with the sharp, puerile murmur of increased function. It is rather a succession of fine murmurs, almost too rapid for the ear to differentiate. When the succession is less rapid, it denotes coarser changes.

When the vesicle itself is the seat of invasion, the first evidence may be a prolonged expiratory murmur, say as 7 to 6 of the normal period. It is doubtless caused by the diminution of the elasticity, of the intravesicular wall, and, like the other, precedes the stage of moist secretion and fine râles. Great care should be taken in examining for these changes posteriorly, because of the dense structures overlying the lung, yet it is here that the earliest information may often be obtained. Prolonged expiratory murmur is found in about one-third of all early cases.

"Bronchial echo" is an early sign first noted by Dr. Amyx, of St. Louis, who gives the following description: "Bronchial echo is elicited by having the patient utter the word '99' after taking a deep inspiration. At the end of the sound there will be a high-pitched bronchial air sound, similar to the bronchial sound during expiration, and depends upon the lung being well inflated before the patient utters '99.' It is during the period following the ending of the sound that the bronchial echo is heard. It may be heard immediately after the sound of the word, or it may become more distinct toward the end of the expiratory sound which follows. The bronchial character of the sound is much higher pitched than that which is heard during expiration without the addition of the voice sound. When '99' is uttered, the tongue presses against the teeth. During this moment the air passing out of the lung is stopped, which causes a sudden backing up of the air in the lung. When the word has been finished, the air rushes out of the lung, giving a higher pitch to the sound produced thereby, owing to the great rapidity of the air escaping from the lung. The value of this sign lies in the fact that it may sometimes be heard very early in beginning consolidation of the lung. In the presence of cavity formation its value diminishes, since such condition can be elicited by other signs."

Just here let me refer to an interesting observation of d'Espine on the early diagnosis of incipient thoracic tuberculosis in children.*

Auscultation as the patient pronounces "333" (the words are more resonant in the French, "*trois cent trente-trois*"), or auscultation as the child cries, will reveal a tone superadded to the voice, which he calls "whispering" (*chuchotement*) in the first stage, and "bronchophony" in the more advanced stage. In the normal child the organ tone of the trachea stops abruptly at the spinous process of the seventh cervical vertebra, where the lung commences, but with a pathologic process in the bronchial glands the bronchial tone is heard further over the region corresponding to the principal location of the glands. The bronchial organ tone is accentuated by the chain of

* Bulletin de l'Academie de Medicine, vol. lxxi, No. 5.

tumefied glands surrounding the air-passages, and sometimes continues back nearly to the spine. The stethoscope is useful to define the extent of the bronchophony, which may extend to the first four dorsal vertebræ, or merely to one of them, or to the seventh cervical, but direct auscultation with the ear gives more definite results. If the child is told to pronounce some words in a low tone, an acoustic phenomenon is noted in case of a bronchial adenopathy similar to what Baccelli calls "aphonious pectoriloquism." The accented whisper is often heard in ordinary consolidation through the anterior wall.

PERCUSSION.—Pronounced dulness on percussion of the spinous processes of the first dorsal or seventh cervical vertebra does not appear until the process in the bronchial glands is in an advanced stage. Interscapular dulness is likewise a sign of far-advanced lesions in the child, as also the bronchial souffle. The finding of the souffle associated with the normal superficial vesicular murmur indicates that the trouble is in the glands, not in the lungs. I believe this is of value in differentiating the site of the initial lesion.

The *x*-ray adds little in the examination of incipient cases where the lesions are not gross enough to throw a shadow. If they are so determined, the diagnosis can generally be more accurately made by other methods.

The TUBERCULIN test is being again urged by some in high authority. I would not oppose the tuberculin treatment in suitable cases, but I would emphasize the statement that the greatest care and watchfulness be observed during the treatment. It is wrong to use so potent a remedy and not be able to command rest and careful observation during its use. In my own experience with tuberculin I confess I am still uncertain as to its definite value. Some of my cases did well, but so did others of equal advancement without the treatment. Others did badly. Without going into statistics from my own cases, I think I can say that I feel justified in using tuberculin in treatment, beginning with the smallest doses in cases where there is not much impairment of general function—in afebrile cases, and where there can be close notation of all phenomena. We must remember that each active case has its own tuberculin laboratory, and while there is activity, as shown by the thermometer and other tests, it is wrong to add to the burden already too heavy.

I am not convinced of the wisdom of using tuberculin as a means of diagnosis. I have, I am sure, in several cases aroused a latent tuberculosis to active conditions. I have seen the same results in the practice of others. If there is suggestion of incipient tuberculosis which cannot be fully proved,

it is better to give the patient the benefit of the doubt and anticipate, by treatment, rather than to force a conclusion. Which one of us would be willing to use in his own case a tuberculin injection to make positive a condition in which the physical symptoms are inefficient, and which may easily be overcome by care and right living. The *argumentum ad hominem* should have place with us in such decisions. I would not attempt to controvert the statements of those who advocate the use of tuberculin as a diagnostic aid, for the question is unsettled, and some of our best men are in favor of it, but, just as when used as a remedial agent, I would urge exceeding care, and then use it only in cases where a diagnosis is immediately important and not to be otherwise accomplished.

That I may be clearly understood let me again say that tuberculin in treatment should be used only in small doses (not exceeding 1–1500 milligram O.T., or 1–15,000 milligram T.R., for initial dose) in selected, non-febrile cases, carefully watched. That unless there is the greatest urgency, it should not be used for diagnosis only, especially if the index afternoon temperature and other indications are so suggestive that the case can be classified and observed. I would repeat the words of Trudeau, who, while stating his belief that tuberculin is of value in selected cases, adds: "The physician who disregards as of no importance an increase of the fraction of a milligram of tuberculin or the rise of a few tenths of a degree of temperature, will meet with disappointment and disaster in the application of the tuberculin treatment."

The same warning, with even greater force, should be remembered in making a diagnosis. Trudeau again says: "The tuberculin test should never be resorted to until the physician has failed to reach a conclusion after a careful application of the clinical methods of diagnosis, and as our skill in the detection of closed tuberculosis increases, it may be necessary to use the test only in exceptional cases, as the reactions at best are sometimes an unpleasant experience for the patient." Lawrason Brown says: "It is plain that tuberculin should be administered therapeutically only to those patients whose general condition is good, and it should rarely be given unless the temperature seldom goes above 99.5° to 100° F., and is normal or subnormal in the morning."

From my own experience with tuberculin, I would insist that the hypodermic method be employed only by those who have the most complete control of their patients, whether it be in the sanatorium or in private. In my own cases not only do I begin with the minimum dose, but enjoin complete rest for at least a week, or until the susceptibility of the patient can be

estimated. To render the use of tuberculin safer for those who cannot make the close observation needed in hypodermic methods I have been experimenting, during the last year, with the direct inunction of an ointment containing tuberculin. I believe one factor in the seeming results is the counter-irritation.

With the surface application of tuberculin I believe it may be possible to have three results without danger: First, the diagnostic test—not always definite, especially in the adult; second, the therapeutic value, and third, the stimulus of counterirritation.

While my experience has been too recent to be convincing, yet I am sure that enough of tuberculin can be absorbed by this method to secure reaction. In one case the temperature went to 100° F. repeatedly. White, in the International Archives for October, 1910, reports favorably on the use of tuberculin through scarification, asserting that constitutional reaction from this method is as possible as by the hypodermic. Koppleman has applied the von Pirquet technic for the systematic administration of tuberculin, lauds its numerous advantages over the usual methods, and asserts that it surpasses them in mildness, constancy, and gradual action. May I be pardoned for having in this instance interwoven methods of treatment and diagnosis, for the principles and application are to be considered as one.

Channels of Invasion in Relation to Symptoms and Diagnosis

The routes of invasion are worthy of continued investigation. At present the respiratory tract is by many considered the main channel, but with a larger opportunity for investigation than formerly, I am convinced that many more pulmonary cases are directly infected through the lymphatic and blood-channels than are recognized by the average physician. The phenomena of invasion by the bronchial route have been studied not only clinically, but in their pathologic sequence, and to such an extent has this study served that it has, until recently, overshadowed the other scarcely less important questions of infection along the lymph-channels, or around the arterioles and capillaries by the blood-current. Without dwelling on the bronchogenic development along the respiratory tract, which, to some extent, we have all followed, I would emphasize the phenomenon of infection through the lymph-channels as a factor in the etiology of tuberculosis. Here again we find three methods by which the bacilli find their way into the lymphatics. First, it is asserted by Behring, who quotes Römer, that albuminous bodies may pass through the walls of the alimentary canal and into the blood and lymph unchanged in new-born animals, but not in adults.

Behring fed bacilli to adult guinea-pigs, and the bacilli passed through the alimentary tract without doing harm, while eight-day-old guinea-pigs similarly treated died quickly. Attenuated bacilli fed to young pigs were found in the blood. Ribbert believes that most cases of pulmonary tuberculosis are hematogenous, and that the bacilli pass into the lymph-channels and to the bronchial lymph-glands. From this point they are carried by the blood-stream to the lungs, usually to an apex, because of comparative local anemia and a retarded lymph-flow, due to hindered movement from ossification of the upper ribs.

A most important recent contribution to the study of lymphatic infection is a paper by George B. Wood. After recording the results of his most interesting experiments, made in the laboratory of the Pennsylvania Live Stock Sanitary Board, and citing many authorities, he concludes: "The tonsillar tissue of the throat, because of its peculiar anatomic construction and of its topographic relations, is more liable to become infected by tuberculosis than any other part of the upper respiratory tract. In nearly all cases of advanced pulmonary phthisis the faucial tonsils become inoculated. In about 5 per cent. of hypertrophied pharyngeal tonsils some form of primary tuberculosis will be found. Primary infection of the faucial tonsil is a rarer condition."

Tuberculous adenitis in the cervical lymphatics develops, in the majority of cases, from infection originating sometimes in the faucial tonsils, but more frequently in the pharyngeal tonsil. The tubercle bacillus is probably unable to pass through the tonsil without having first overcome the vital resistance of the tonsillar tissue. The danger of systemic or pulmonic infection resulting from a tuberculous lesion in the tonsillar tissues of the throat is about equal to that of tuberculosis of the cervical lymphatics. The lesion to be expected as a resultant infection from the broken-down glands of the neck is a miliary tuberculosis of the lungs. Further than this possibility, tuberculosis of the lymph-glands of the neck is more dangerous than a localized tuberculous lesion in any other portion of the body.

Importance of Posterior Lesions.—Diminution of the percussion-note, with harsh breathing and crepitation heard in the upper interscapular region, are suggestive of lymphatic infection and infiltration of the bronchial glands. The cases we have noted of this class run a much more rapid course than those in which the infection has been through the respiratory tract. It is true that the premise is hard to prove, but the fact remains that the cases most difficult to control have been those in which the physical evidence was most marked in the upper dorsal region. I would again urge

that no chest examination is complete without most careful investigation of this region.

General Symptoms not Indicative of Extent of Local Lesion.—The progress and extent of the local lesions do not go *pari passu* with the general condition in pulmonary tuberculosis. This may be truthfully said of many diseases, but it is emphatically true, I believe, of pulmonary tuberculosis. We find it so in lobar pneumonia, which is also a specific disease. It is true, likewise, in many conditions of pus poisoning and local infection. It is, therefore, no new proposition, but one that has not been given its full value in formulating our diagnosis and prognosis in this disease. An advanced pathologic stage is not incompatible with fairly good general conditions. Such cases, in spite of extensive tissue disintegration, may become chronic; the advance may be checked, and the patient may live out his expectancy.

Therapeutic Suggestions

The care of the tubercular is not routine. Too often we make it so, but slowly and surely we are beginning to value special adaptation and care of every detail. While there are some indications that are common to most cases, there are others that are almost as important, because of the absence of general consent as to the best methods of meeting them. In mentioning a few of these I would not be thought to include all, but only a few, complications where bedside study has aided practical conclusions.

First of all, but by no means all, is the necessity for right living. Proper food, thoroughly masticated and selected for each case, is the foundation. I do not believe in overfeeding, nor do I aim at rapid weight increase. I believe much harm has been done by abusing the rules of normal nutrition, but time does not permit more than a reference to this important subject. Fresh air, rest, mental and physical, in acute stages, candor on the part of the physician, and courage on the patient's part, are all important.

Mechanical Treatment of Hemorrhage.—My experience warrants agnosticism as to the value of medication in hemoptysis. The only remedy that seems to have been of the least use is opium, and that only as a tranquilizer—not needed if physical and psychic rest can be obtained without it. Its best effect is to lessen the hacking cough so often persistent. Without discussing the various procedures recommended, I would say that we have found the restriction of movement of the affected lobe the best method for the relief of hemoptysis. A good-sized towel is rolled—not folded—until it resembles a wide roller bandage. It is placed over the site of hemorrhage,

or as near as it can be estimated, either by previous knowledge of the case or by auscultation and palpation—never by percussion under such conditions. The roll is placed in position at right angles to the ribs, and half-way from the sternum to the outer boundary of the thorax. A wide bandage is passed around the chest, and pressure made on the roll until the thoracic movement of the side is limited. The bandage is then fixed with safety-pins, the patient placed in an easy recumbent position, with head and shoulders slightly raised, and an opiate given if there is much restlessness and anxiety. The bandage is adjusted from time to time, and kept on for at least a fortnight. A thoracic tourniquet or truss simplifies the application of the method. Compression is made by a pad on an adjustable screw attached to a band connecting a larger pad placed over the posterior chest. The ice-bag may be used with the compression roll. In some cases I have thought that good resulted from the exhibition of the nitrites—or nitrite of amyl. Glonoin is often helpful. During the last two years I have used compression over an acute infection to lessen the tendency to absorption, with all its attendant symptoms.

Hemorrhage is not Always Harmful.—While it is true that hemoptysis is, in most cases, an indication of tuberculosis, yet the bleeding itself is sometimes palliative, at least for a while. When there is a local congestion, as when the bacilli have invaded the walls of small vessels by way of the perivascular lymph-channels, or when there has been inflammatory reaction incited by the tuberculous process, a resultant hemorrhage is not an unmitigated evil. Obstruction in the lung to the blood-flow may induce dilatation of the right ventricle, and, as a remote consequence, congestion of the liver, kidneys, and extremities (Nothnagel). The local blood-letting may, for a time at least, permit equalization of blood-pressure in these parts, as well as in the lung generally. We have had cases in which there was a marked improvement of the vesicular murmur and a better percussion-note within a week after a small pulmonary bleeding. These cases are exceptions, for often the hemoptysis is recurrent, and followed by vital depression and increase of the physical symptoms.

Control of Night-sweats by Timely Stimulation.—The etiology of night-sweats in tuberculosis is an unsettled question. It seems reasonable to consider them an evidence of exhaustion, following fever, as they often do, and being immediately consequent upon the pulse decline during a sound sleep. This belief and the regularity of the recurrence have led us to adopt a simple and sometimes effective treatment. The time of the beginning of the sweating is recorded as nearly as may be. Afterward the night atten-

dant wakes the patient just before this time, and gives an ounce of whisky. Other stimulants have been tried, but the whisky seems best adapted. With private patients an alarm-clock is sometimes used. Good ventilation, light covering, the whisky as suggested, and hydrotherapy, especially the spinal douche, are helpful. Of drugs, I prefer camphoric acid.

Control of Fever.—As the fever in tuberculosis is conceded to result from absorption of the toxins of tubercle and other bacilli, its treatment is too often futile. Rest is a necessity. A degree of fever should mean "bed," at least during the rise. More than that means absolute rest. Sometimes patients whose temperature is normal in the morning may be up for a few hours preceding the fever. The room must be well ventilated. Often they lie on cots on the veranda, but the idea of complete rest—mental as well as physical, if possible—is maintained. Remembering the advocacy, by good authorities, of guaiacol externally in typhoid fever, we have used it in a number of cases of tuberculous fever, but the results have not been definite enough to warrant its indorsement. Cool sponging is always grateful. If the temperature is high, a basin of water is placed by the bedside for the frequent wetting of a towel, which the patient keeps on his forehead, or, if need be, on his chest. It is still better if an attendant uses a sponge, allowing the water to evaporate and then applying more.

Control of Cough.—There is no symptom that is more aggressive, and oftentimes more yielding, than the cough in chronic tuberculosis. Patients should be taught how to cough, or rather how to expel the sputum with little coughing. A deep breath is slowly taken, and then a quick, strong expiration or "exhaust," as one man—an engineer—calls it. In some cases there is very little coughing. When the pharyngeal and laryngeal irritation is great, relief is often obtained by inhaling a few drops of some anodyne mixture, such as equal parts of chloroform, alcohol, and ether, with a little creosote. This is inhaled from an ordinary drinking-glass, or, better still, from a glass tube in the center of which is a little cotton or a small roll of blotting-paper. The tube is kept corked when not in use. Sipping hot water is sometimes efficient.

Heart Tonics in the Early Stages, with Increased Lung Expansion, to Encourage Pulmonary Circulation.—It has been fully demonstrated that heart weakness is a large part of the clinical picture in tuberculosis. In a majority of fatal cases the heart has been found abnormally small and nearly always flabby. Whether this is a result or, as Brehmer interprets, a forerunner of pulmonary tuberculosis, it demands attention—early attention. Diminished blood-pressure in the lung favors tuberculous

processes. The heart muscle partakes largely of the strength or weakness of the general muscular system. The inference is obvious. In all our cases the condition of the heart is a matter of inquiry from the beginning. Advantage is taken of everything that will tend to relieve lung stasis and strengthen heart action. Rest is ordered when indicated, with exercise, carefully guarded, deep breathing, arsenic and strychnin, and, in some cases, when there is arterial dilatation, digitalis in small doses. I believe our best builder, so far, is the sodium cacodylate in daily hypodermic doses of a grain or more.

Auto-infection.—Use of Normal Salt Enema.—This topic deserves more extended notice. I believe it to be one of the most important chapters in the study of the symptoms and care of tuberculosis. Let me briefly call to mind that constipation (with intercurrent diarrhea) is found in most cases of pulmonary tuberculosis. It has been shown that bacilli in the sputum may safely pass the impaired gastric secretions, travel the course of the small intestine, and be found in the fecal accumulations in the colon and rectum; or they may pass into the deeper structures or the lymph-channels or blood-channels through an uninjured mucosa. The conclusion seems warranted that reabsorption of bacilli, with the products of metabolism and decay from the intestinal tract, is a potent addition to the primary infection. That this is more than a hypothesis can, I believe, be demonstrated. There is a therapeutic suggestion which we try to make practical. In appropriate cases a high enema containing a small quantity of glycerin is given daily for a week. By that time the lower bowel is probably emptied of all scybalous masses. After that, the normal salt solution is used in quantities which can be retained. The exact form of treatment may vary, but the principle is kept in mind. The reduction of temperature and, in many cases, the improvement in assimilation following this part of the treatment certainly suggest cause and effect. The premises may be wrong, but the conclusion is encouraging. The fact that other bacteria are factors in temperature-increase in tuberculosis does not alter the deduction as to the value of the method. Auto-infection direct from a pulmonary lesion need not be discussed here.

Auto-immunization.—There is a large field for investigation here. Every victim of tuberculosis has his own tuberculin. If resistance can be made early enough or before the supply is too rapidly taken into the circulation, the patient becomes immune. The number of cases in which gland tuberculosis has become latent, where no pulmonary infection exists, is an illustration. Because of the absorption of a greater or less reaction to

this product of the local infection it is wrong to add to the tuberculin by extrinsic dosage. Not until the fever and the general symptoms give evidence that the infection is latent and immunity begun can we add the tuberculin of the laboratory. Even then it is possible to revive the former activity.

Artificial Immunization.—The use of tuberculin is justifiable and established, but dangerous if not used with exceeding care. And I would again urge the limitations before referred to.

Waning Importance of Creosote.—Following the adoption of the suggestion last mentioned, I have been willing to lessen greatly the amount of creosote and its substitutes. In fact, except with the idea of improving digestion and nutrition,—and I confess my want of faith in this,—the use of this class of remedies is almost forgotten in my treatment. Certainly large doses of creosote, guaiacol, and their carbonates are not given. Here, again, I may be at variance with many of our best observers, but I predict that in another decade very few, if any, of this class of remedies will be used internally in the treatment of tuberculous cases.

Waning Value of Climatic Change.—This is a topic which may only be mentioned here. The fact that tuberculous patients may recover in any climate; the injustice of sending the sick of any class away from the comforts of home and beyond the reach of friends to some mountain or plain where consumptives congregate and herd; the uncertainty of selection, even when change is proved best—these and many more considerations have wrought a marked reversal of practice with the thoughtful leaders in this department. The influence of Trudeau, Flick, and Knopf is becoming more potent every day in correcting this well-meant but mistaken action of the family physician.

The Value of the Spinal Douche.—No other simple measure seems to give the quick result that this does. In cases in which there is poor circulation in the extremities, morning languor, and chilliness, the direction is as follows: The patient early in the morning stands in the bath-tub with the faucet turned to throw water of about 100° F. A large sponge is held under the faucet, and is then pressed against the cervical spine. Repeating this several times, the cold water is turned on and applied as the other. After very slight rubbing with a towel, the patient partly dresses and lies down for half an hour. This seems better than the ordinary cold bath or the shower.

The Value of the Cacodylate of Soda.—In the very important field of internal medication in tuberculosis I wish to call attention to two agents.

I do not mean to exclude others, as indicated by symptoms, but emphasize these because I believe in their effectiveness and because they have been too greatly neglected.

The first is arsenic. I prefer the cacodylate of soda, which is rich in arsenic and has a physiologic limit greater than the ordinary forms and dosage. A half-gram of cacodylate of soda, corresponding to 5½ grains of arsenous acid, has been given to a dog without injurious consequences.

Having studied the value of Professor Ehrlich's now famous "606," which belongs to this group, though materially different chemically, you may the more readily consent to my statement of the worth of the cacodylate of soda. I have used the cacodylate of iron, but see no advantage in it over the other. I use it by hypodermic injection in normal salt solution.

Sublimated Iodin in Local Infection.—Iodin is indicated in many phases of tuberculosis. It is an ideal germicide, and its action in stimulating metabolism and nutrition is well known. I use iodin in tuberculosis directly to meet these two indications. Possibly its most direct result is shown when brought into direct contact with the air-passages in grip, influenza, acute pharyngitis, tonsillitis, or laryngitis. Much depends on the method of application, and here the most direct is the simplest. A few drops of the tincture in a small glass is placed in a larger glass containing hot water. The direct heat of the water-bath causes the rapid evaporation of the iodin, which, when inhaled, reaches every portion of the respiratory tract. This cannot be so well accomplished by the spray or the vapor, and the effect is almost immediate, in the conditions above mentioned. In tuberculosis of the upper air-passages and of the lungs, where there are ulcerated surfaces, this direct method has been of value to me.

Were it not that time forbids, I would emphasize, as an additional therapeutic agent, the fixation of the chest in hemorrhage, in acute tuberculosis with rapid absorption and consequent fever. There are many other indications, such as the care of the heart, vasomotor instability, excessive cough, etc., but I have mentioned only these, in which, I believe, I have been able to work out some helpful deductions.

There are many other questions in the study of the care of these cases which cannot be discussed in this paper. The importance of frankness with the patient, the necessity of estimating and using psychic suggestions in each case, the methods for guarding others, the hardship of needless exile, proper clothing, food, the value of regular stimulation in some cases, and, above all, life in the open air or its equivalent, are all important in the great

battle that is to give us a final conquest over this dread but limitable and curable disease.

In what has been said I have endeavored only to mention the evidence of pulmonary tuberculosis in its earliest manifestations, and only such evidence as in our present knowledge seems trustworthy. I believe also that the therapeutic suggestions are worthy of note. There are many hypotheses yet to be worked out, many deductions to be selected or rejected. From a somewhat large field of opportunity, I feel that I have brought you very little. No study of the subject can ever be complete. The further the advance, the greater the prospective. We are only beginning to realize on investments already made.

My concluding thought is that the most important factor in the early diagnosis of tuberculosis, one which embraces and utilizes all methods, is exceeding care. It is this that has placed the civil engineer in the forefront of civilization, to whom the error of the smallest fraction might result in disaster. It is this that has given modern surgery its wonderful command of conditions formerly prohibitive, and the bacteriologist his high rank in scientific advance. It is such care and the conscientious application of what is known, as well as the selection of what is being formulated by the never-ceasing work at the bedside and in the laboratory, that can alone fit the diagnostician for the work to which he is called.

THE TREATMENT OF THE SECONDARY ANEMIA OF TUBERCULOSIS BY THE HYPODERMIC INJECTION OF IRON

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In the treatment of tuberculosis new remedies and new methods of treatment are continually thrust upon a credulous profession, until one hesitates to advance new theories or stir up long-forgotten ones lest he be made an object of ridicule by his more conservative brothers. However, it is not in the scope of this paper to suggest a new specific or to deal with any particular form of treatment that may be considered new, unless it be the manner of administration. Iron, arsenic, and strychnin have each held the stage at various periods in the treatment of this disease, and although they have never worked wonders, much credit may be given their therapeutic value. It is the combination of these drugs and the fact that they are given hypodermically, and, further, that the results obtained are far better than by the older methods of administration, that prompts us to report the results of our work along this line. Neither need our work be considered new, nor our conclusions the result of a few months' use of this method of treatment. Nearly three years ago* we reported forty-two cases of pulmonary tuberculosis in which we gave hypodermics of iron for the anemia which so often follows this disease. The results were so gratifying that we have since used the method extensively, and have never had cause to regret our enthusiasm over the hypodermic use of these drugs.

The fact that it is given by injection overcomes the previous objection to its use, namely, that of gastric disturbance and constipation. Never, in all our cases, have we seen a patient on whom the drug produced the slightest disturbance of the intestinal tract; and in a disease as chronic in its characteristics as is tuberculosis, great care must be taken lest we impair the functions of the greatest friend a tuberculous individual has—his digestive ap-

*Peters, L. S., "Medical Record," N. Y., October 10, 1908.

paratus. It is safe to say that were more drugs given hypodermically, instead of by the usual channels, better results could be expected, and patients saved much of the promiscuous drugging to which they are now subjected. The very fact that we are able to bring the average blood to normal with 20 doses given on twenty consecutive days, while with the older methods of Blaud's pills and the like we were from two to three months and sometimes longer, is proof positive of the saving of needless drugging, as mentioned above.

Understand, we do not advocate this method of treatment as a cure-all for tuberculosis, or even a remedy that works wonders in the treatment of the disease. Only do we claim that the secondary anemia is easily overcome, and that the patient, after a few injections, is made to feel the tonic effects of the drug, and is better able to begin the long fight for health than he would have been had we left the restoration of the hemoglobin content of his blood to climate and the effects of altitude.

Aside from the effects of the iron on the anemia, the strychnin tends to produce a more equal and stronger circulation, and in a number of cases we have noted a marked improvement in cyanotic conditions and a rapid disappearance of cold extremities after its use. It is also generally conceded that strychnin tends to increase blood-pressure, and for this reason it would seem that its use in combination with the iron at sea-level would tend to overcome the hypotension as it exists in all or the majority of cases of tuberculosis at low elevations. Of course, at this elevation (6000 feet) we believe we have shown that the pressure is increased, and that our tuberculous patients show pressures equal to the normal as worked out at sea-level.

The value of the arsenic content of the formulas as used may be problematical, but since it has been used for years in the treatment of phthisis, we may still make use of old customs and try to believe that it tends to promote metabolic processes. This much we know. The tonic effect after a few injections of iron, arsenic, strychnin, and the sodium salt is marked, appetite is increased, digestive functions are bettered, and the patient experiences a feeling of well-being not noticed in any other form of treatment. In fact, it is our common experience to have patients ask for a series of injections merely for the tonic effect.

The observations upon which the following table (p. 294) is based were made in a closed institution, at an elevation of 6000 feet. Here, at this elevation, anemia is rather an insignificant factor in tuberculosis. The cases reported cover a period of five years, in which time we have treated over 600 tuberculous invalids, and we are able to show but 254 with secondary anemia.

The hemoglobin is recorded in percentages only since that is sufficient for all practical purposes.

In giving the pulmonary status of the patient, we have used Turban's classification, and indicated the degree of involvement by the Roman numerals I, II, III, corresponding roughly to incipient, moderately advanced, and far-advanced cases.

The percentage of hemoglobin is recorded both on admission and after treatment, as is also the number of injections required to produce the effect.

We make use of the following formulas:

1.	Iron citrate	0.1	gm. (1 decigram)
2.	Iron citrate	0.05	gm. (5 centigrams)
	Strychnin sulphate	0.0005	gm. (½ milligram)
	Sodium arsenate	0.001	gm. (1 milligram)
3.	Iron citrate	0.05	gm. (5 centigrams)
	Metarsinate of sodium	0.01	gm. (1 centigram)
	Strychnin sulphate	0.001	gm. (1 milligram)

From observations extending over a period of five years we draw the following conclusions:

1. That the hypodermic injection of iron is a specific in the treatment of the secondary anemia of tuberculosis.

2. That the arsenic and strychnin contents tend to promote better nutrition.

3. That the citrate of iron is best suited to the treatment of anemia alone.

4. That the formula containing the sodium salts is most effective as a general tonic.

5. That, theoretically, the treatment should tend to raise blood-pressure.

6. That the hemoglobin is usually made normal after the injections of 20 doses. The greater the anemia, the larger the number of doses required.

7. That the degree of involvement seems to bear no relation to the results obtained, patients in the far-advanced stages responding as quickly as those in the early stages.

8. That this method of treatment should be in the armamentarium of every tuberculosis specialist.

We here append a table of 254 cases:

TABLE OF 254 CASES

Case No.	Status	Hemoglobin on Admission	Hemoglobin after Treatment	Number of Doses	Remarks	Case No.	Status	Hemoglobin on Admission	Hemoglobin after Treatment	Number of Doses	Remarks
1.	II	80	90	20		49.	II	80	95	20	
2.	II	80	88	20		50.	II	80	95	20	
3.	III	85	100	40		51.	III	82	95	20	
4.	III	85	100	20		52.	III	75	90	20	
5.	III	83	100	20		53.	III	80	95	30	
6.	III	90	100	20		54.	III	70	75	20	Died.
7.	III	80	100	20		55.	I	80	90	20	
8.	III	75	95	20		56.	II	80	100	40	
9.	III	80	90	20		57.	III	85	107	20	
10.	III	90	90	20	Died.	58.	II	80	95	20	
11.	II	80	107	40		59.	III	85	88	20	Progressive.
12.	III	80	90	20		60.	I	45	65	20	Died.
13.	III	70	85	40		61.	I	90	105	20	
14.	I	85	100	20		62.	II	75	100	40	
15.	III	80	95	60		63.	III	65	87	20	
16.	II	85	100	40		64.	III	65	86	20	
17.	III	80	90	20		65.	I	60	85	20	
18.	III	88	100	40		66.	II	70	95	30	
19.	III	80	100	20		67.	III	63	90	20	
20.	III	75	90	20		68.	I	80	90	20	
21.	III	80	100	40		69.	III	75	90	20	
22.	III	75	87	20		70.	III	80	90	20	
23.	II	88	100	20		71.	II	55	90	40	
24.	III	65	90	40		72.	I	85	95	20	
25.	III	88	100	20		73.	I	82	97	20	
26.	III	65	92	60		74.	III	80	96	40	
27.	III	90	100	20		75.	III	70	95	20	
28.	II	75	100	50		76.	III	70	90	40	
29.	I	75	95	20		77.	II	72	90	40	
30.	I	80	90	20		78.	III	62	98	60	
31.	II	80	93	20		79.	III	85	98	40	
32.	III	82	95	20		80.	III	80	92	20	
33.	III	70	90	20		81.	III	65	90	40	
34.	II	70	90	20		82.	I	80	95	20	
35.	III	85	95	20		83.	III	80	92	20	
36.	III	70	100	60		84.	III	88	100	20	
37.	III	80	90	20		85.	II	80	95	20	
38.	III	80	100	40		86.	I	85	92	60	
39.	III	80	90	20		87.	III	85	90	20	
40.	III	75	90	20		88.	I	85	91	40	
41.	III	80	85	20		89.	III	70	95	40	
42.	I	85	95	20		90.	I	85	100	20	
43.	I	80	95	20		91.	III	85	100	40	
44.	I	80	100	20		92.	II	85	100	40	Died.
45.	III	80	90	20		93.	III	95	100	20	
46.	I	80	92	20		94.	III	85	98	50	
47.	III	75	95	20		95.	III	80	90	40	
48.	II	75	90	20		96.	III	85	96	20	

TABLE OF 254 CASES.—(*Continued.*)

CASE NO.	STATUS	HEMOGLOBIN ON ADMISSION	HEMOGLOBIN AFTER TREATMENT	NUMBER OF DOSES	REMARKS	CASE NO.	STATUS	HEMOGLOBIN ON ADMISSION	HEMOGLOBIN AFTER TREATMENT	NUMBER OF DOSES	REMARKS
97.	II	95	100	20		145.	II	70	85	20	
98.	III	90	100	20		146.	III	80	80	20	Progressive.
99.	II	70	100	60		147.	I	86	97	20	
100.	III	85	97	80		148.	III	75	90	40	
101.	III	86	95	20		149.	III	85	98	20	
102.	III	75	97	60		150.	III	75	75	20	Died.
103.	III	70	95	40		151.	III	80	85	20	Died.
104.	II	90	95	20		152.	I	85	90	20	
105.	II	80	95	20		153.	I	82	90	20	
106.	II	80	97	20	Died.	154.	III	85	95	20	
107.	III	85	90	40		155.	III	85	100	40	
108.	III	75	90	20		156.	III	80	91	60	
109.	II	75	98	40		157.	III	70	70	20	Progressive.
110.	I	87	101	20		158.	III	85	100	40	
111.	I	90	100	20		159.	III	78	98	40	
112.	I	90	100	20		160.	II	85	95	20	
113.	III	80	90	20		161.	III	85	88	20	Progressive.
114.	III	80	100	60		162.	III	60	80	20	
115.	III	85	92	80		163.	III	72	95	40	
116.	II	75	94	40		164.	III	84	100	20	
117.	II	70	85	40		165.	II	75	85	20	
118.	I	86	95	20		166.	I	80	95	20	
119.	I	90	95	20		167.	III	65	98	60	
120.	II	90	100	20		168.	III	85	95	20	
121.	I	90	100	40		169.	III	80	92	20	
122.	I	90	95	20		170.	II	85	100	20	
123.	II	90	95	20		171.	III	85	95	20	
124.	II	90	100	20		172.	I	87	100	20	
125.	III	75	90	40		173.	III	85	100	20	
126.	III	85	95	20		174.	I	85	100	20	
127.	II	90	100	60		175.	I	85	100	20	
128.	I	85	88	60		176.	III	80	92	40	
129.	I	82	100	20	Died.	177.	III	80	100	25	
130.	II	85	95	20		178.	I	75	100	40	
131.	III	70	95	20		179.	III	80	100	60	
132.	II	80	95	20		180.	III	65	95	60	
133.	II	85	97	40		181.	II	55	95	40	
134.	III	80	93	20		182.	I	85	95	20	
135.	III	80	90	20		183.	II	85	95	40	
136.	III	75	90	20		184.	II	85	95	20	
137.	III	75	85	20	Died.	185.	III	80	97	20	
138.	II	75	98	20		186.	III	80	100	20	
139.	I	87	101	20		187.	III	80	98	20	
140.	III	80	100	40		188.	II	85	100	40	
141.	III	80	100	40		189.	III	88	100	40	
142.	III	85	90	20		190.	III	70	72	20	
143.	III	80	80	20	Died.	191.	III	88	100	20	
144.	II	75	94	40		192.	III	81	96	20	

TABLE OF 254 CASES.—(*Continued.*)

CASE NO.	STATUS	HEMOGLOBIN ON ADMISSION	HEMOGLOBIN AFTER TREATMENT	NUMBER OF DOSES	REMARKS	CASE NO.	STATUS	HEMOGLOBIN ON ADMISSION	HEMOGLOBIN AFTER TREATMENT	NUMBER OF DOSES	REMARKS
193.	III	65	100	60		224.	I	88	101	20	
194.	III	85	100	20		225.	III	80	98	20	
195.	I	86	100	40		226.	II	80	90	20	
196.	III	84	90	20		227.	III	75	90	40	
197.	I	88	100	20		228.	III	77	95	20	
198.	II	85	100	20		229.	III	80	100	20	
199.	III	85	95	40		230.	III	85	90	20	
200.	III	80	90	20		231.	III	84	102	40	
201.	III	65	90	20		232.	II	78	92	20	
202.	II	70	95	40		233.	III	84	92	40	
203.	III	80	100	40		234.	III	73	78	20	Died.
204.	II	85	98	20		235.	III	80	90	20	
205.	III	60	80	20		236.	III	75	79	20	
206.	III	86	100	20		237.	I	70	88	20	
207.	III	80	90	20		238.	II	73	100	20	
208.	III	80	95	40		239.	III	80	95	20	
209.	III	85	100	20		240.	I	75	79	20	
210.	III	84	100	20		241.	III	85	96	20	
211.	II	80	90	20		242.	III	88	105	20	
212.	III	79	97	20		243.	III	88	96	20	
213.	II	80	95	20		244.	III	70	95	20	
214.	III	80	94	20		245.	II	75	101	40	
215.	II	85	100	20		246.	I	74	95	20	
216.	III	85	100	20		247.	I	70	90	60	
217.	III	80	100	20		248.	I	88	95	20	
218.	III	85	95	20		249.	III	58	95	30	
219.	II	70	100	20		250.	III	80	85	20	
220.	I	70	100	20		251.	III	80	90	20	
221.	III	70	105	20		252.	III	80	85	20	
222.	III	83	95	20		253.	III	75	96	20	
223.	II	95	106	20		254.	III	74	85	20	

HYPOTENSION AND TACHYCARDIA IN THE TUBERCULOUS

By John Ritter, M.D.
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It is now generally conceded by competent observers that pulmonary tuberculosis as it is now clinically observed is usually accompanied by a marked diminution in the blood-pressure, and that this lowering of the tension is ascribed to a toxemia, to the circulating in the blood-stream of various toxins of bacillary origin, and that this developing and elaborating of the toxins during the progress of the disease and subsequent entrance into the circulation in progressively increasing amount will induce irritation and dilatation of the arteries, a vasomotor irritability, and subsequent paresis and attendant diminution in the blood-pressure. That tuberculin, the toxin elaborated during bacillary growth, has a definite influence on the circulation and on the arterial tension and blood-pressure has been amply demonstrated by F. Bauer, of Vienna, who, after repeated injections of tuberculin, reacting negatively, observed no variation in the blood-pressure, but if the injection was followed by a positive reaction, a slight, sensible lowering of the pressure was always observable. The direct effect of the toxemia is to cause a rapidity of the heart's action, accompanied by a weak pulse, a want of arterial tone, resulting in diminution of the internal pressure; hence there is a corresponding lowering of the blood-pressure with the progress of the pulmonary lesion and attendant toxin absorption, and, inversely, with a lessening of the active tuberculous process, lessening of toxin elaboration and absorption, a corresponding rise in the blood-pressure may be demonstrable. In most tuberculous patients a distinct variation in pulse and tension is always clearly observable, whereas in a healthy individual a very slight variation in pulse-rate and blood-pressure may be noticeable. The pulse-rate is, in health, somewhat lower while in the recumbent position, higher in the upright, and at a point midway between the two in the sitting, with a corresponding rise of the blood-pressure in the horizontal, a lowering

of pressure in the vertical position registering a pressure between the two in the sitting posture.

In the taking of the blood-pressure, all observations were made and recorded as nearly as possible between the point of maximal pressure, or when the radial pulse was no longer palpable, and the point where the pulse returned or was just palpable, the correct reading lying between these two points. In all, about 400 observations, chiefly in tuberculous or suspected cases, were made. The records of 188 cases of pulmonary tuberculosis, representing the three stages of the disease, as recognized by the National Association, were taken at the Polyclinic, in Chicago, by Dr. O. W. McMichael, a mercury manometer being the instrument in use, and all readings taken with the patients in the sitting position; 102 of the 188 cases were females and 86 males; 103 incipient—38 males and 65 females; 49 moderately advanced—23 males and 26 females; 36 were far advanced—25 males and 11 females. As to ages, in the 103 incipient cases 2 were below 10 years; 32 between 10 and 20 years; 25 between 20 and 30 years; 34 between 30 and 40 years; 8 between 40 and 50 years, and 2 over 50. Of the second stage cases none were below 10 years, 7 were between 10 and 20, 13 between 20 and 30, 17 between 30 and 40, 8 between 40 and 50, and 4 over 50. Of the third stage cases, 1 was between 10 and 20, 8 between 20 and 30, 14 between 30 and 40, 8 between 40 and 50, 5 over 50, making a total of 36 far-advanced cases. These were all ambulatory cases.

The blood-pressure in the 103 first stage cases varied as follows: One a pressure of 86, 3 of 90, 5 between 95 and 105, 34 between 105 and 115, 15 between 115 and 120, 23 between 120 and 130, 17 between 130 and 140, 3 between 140 and 150, and 2 had a pressure over 150. The variation in the blood-pressure of the 49 second stage cases was as follows: Seven showed pressure between 95 and 105, 10 between 105 and 115, 5 between 115 and 120, 15 between 120 and 130, 6 between 130 and 140, 5 between 140 and 150, and 1 over 150. The 36 third stage cases ranged as follows: One below 95, 9 between 95 and 105, 8 between 105 and 115, 10 between 115 and 120, 5 between 120 and 130, 1 above 40, and 2 above 50.

In many with a blood-pressure about 120 the pulse and temperature were approximately normal, a low pressure being usually accompanied by an accelerated pulse with increased temperature, while in some cases with a low pressure the temperature was found subnormal and pulse normal. Comparing the ages of these 188 tuberculous patients with the blood-pressure showed no relationship—the case of a youth of nineteen, blood-pressure 115, temperature 99.8° F., pulse 124, respiration 24, as compared with an

adult of forty-seven with an equal tension of 115, temperature 98° F., pulse 120, respirations 24.

Dr. W. H. Watterson, of the Lake County Tuberculosis Institute at Waukegan, Illinois, submitted to me the blood-pressure observations of 16 patients under his care at the sanatorium—6 incipient, 2 moderately advanced, and 8 far advanced. These pressure records were all taken with a mercury sphygmomanometer while the patient was in the sitting posture. Of the 6 incipient cases, the pulse, sitting, ranged from 78 to 100, and the blood-pressure from 104 to 135. Three of the incipient cases showed a pressure below 112, suggesting a pulmonary involvement with poor resisting power, probably a high grade of toxemia, while the other three gave a pressure above 120, indicating, most likely, a slow involvement with better recuperative elements. One of the cases, a youth of twenty-one, temperature 98° F., pulse 100, registered a tension of 132; the other, a youth of eighteen, temperature 100° F., pulse 100, and a blood-pressure of only 104. The two moderately advanced cases registered a good blood-pressure, both girls showing a tension above 120.

The 8 advanced but arrested cases showed nothing unusual, a pulse varying between 78 and 100, and a pressure of 108 in an advanced case in a youth of twenty-four as against a pressure of 140 in a chronic fibroid phthisis in a man of fifty.

It may be interesting to compare with these 204 positive tuberculous cases represented by the three stages of the disease the blood-pressure of 54 non-tuberculous individuals—33 males and 21 females. The lowest pressure registered by a non-tuberculous female was 105; the highest by a male, 135; 5 females registered below 115, and 16 above 115. Temperature and pulse in 20 out of 21 females were normal, and of the males, 6 showed a pressure below 120, and 27 a pressure above that point. Temperature varied from 97° to 100° F.; pulse, 78 to 120; ages, from 11 to 49.

In taking the blood-pressure and pulse-rate of tuberculous patients in the three stages, nothing more striking can be demonstrated than that usually the arterial tension was lower and the pulse-rate higher in the actively progressive cases than in the chronic or arrested cases. S. G. Bonney, in his text-book on "Tuberculosis," p. 168, remarks that it is noteworthy that the differences in blood-pressure are more pronounced in tuberculosis than in health; that the blood-pressure is progressively reduced in the advanced stages of the disease, and that certain intercurrent affections in the tuberculous tend to raise the blood-pressure.

From similar observations Pottenger has formulated the following:

1. In advanced pulmonary tuberculosis the blood-pressure is low.

2. Causes which favor this low blood-pressure are: (*a*) Toxemia—the action of the toxins on the vasomotor dilators; (*b*) weakness of heart muscle, and (*c*) general emaciation.

3. Causes which maintain a proper amount of tension are cardiac hypertrophy and thickening of the arterial walls.

Naumann studied 100 cases of chronic, practically inactive and uncomplicated pulmonary tuberculosis, arriving at similar conclusions, viz.: In 69 the blood-pressure was over 130; in 13, between 115 and 130; and in 8 cases, below 115.

Theodore C. Janeway, in his "Clinical Study of Blood-pressure," devotes only a few pages to the arterial tension in the tuberculous. On p. 231 he mentions that low tension is a constant symptom in tuberculosis, even in the early infection. Hypotension is the rule in the more advanced stages, especially towards exitus.

Nardi, of Padua, who thoroughly studied but a limited number of cases, —30 in all,—arrived at like results. Of the 30 cases, 9 showed a lowering of the tension; 12 were within normal limits, and 9 showed a hypertension. He divides all tuberculous cases into two groups: The first group, the energetic tuberculous with normal or overnormal pressure, a relatively large heart, a better development of the left ventricle, a good body development, a good resisting power, and a better prognosis. The second group is designated as the torpid tuberculous, a pressure below normal, a relatively small heart, positive clinical picture, poor resisting power, and an unfavorable prognosis. He maintains that the prognostically unfavorable blood-pressure lowering in a certain class of the tuberculous is the direct result of the faulty development of the heart, reviving Rokitansky's theory of the small heart in the phthisical.

The above blood-pressure observations and pulse-ratings were nearly all taken with the patient in but one position, and that was sitting, and, after taking a number of tension records with the patient in the sitting position and arriving at similar conclusions, I began taking the pulse-rate and blood-pressure of every tuberculous or suspected tuberculous patient in the three positions—lying, sitting, and standing. Every patient's pulse and blood-pressure were first taken in the sitting position, and then only after he had assumed this position for about ten minutes. The patient was then required to stand up, and when in the upright position for about four or five minutes the pulse-rate and tension were again taken; the patient was then requested to lie down, and after waiting several minutes to allow the heart to adjust itself

to the changed condition, the pulse and blood-pressure were again taken, and then comparisons in the pulse-rate and arterial tension in these changed conditions were made. The greatest and most apparent or real differences in pulse-rate and blood-pressure were demonstrable with the patient in these three varying positions. In many cases almost immediately on changing from the vertical to the horizontal position a distinct drop in the pulse-rate and a corresponding rise in blood-pressure were observable.

In place of the Riva-Rocci type of manometer, I made sole use of an aneroid instrument, and, as in the above measurements, only the systolic pressure was observed. As it is desirous to ascertain the pressure within the aorta, the readings were all made as near the heart as possible; the armlet of the sphygmomanometer was adjusted to the upper arm, and the arm held in a position as nearly as possible on the level with the third rib, in order to insure a uniform reading.

In taking the pulse-rate and blood-pressure of 74 ambulatory cases at the tuberculosis clinic at Rush Medical College, representing the incipient tuberculous, the moderately advanced, and advanced, as well as tentative and non-tuberculous, quite a difference in results was tabulated. In the records of the 32 incipient cases, representing the ages from sixteen in the youngest to thirty-six in the eldest, all taken in the three varying positions, one is impressed by the frequency with which the pulse-rate stands in inverse proportion to the blood-pressure. This variation cannot be referred to as a mere coincidence. With the gradual rise of the pulse first from the lying to the sitting, then to the standing position, there is a proportional fall in the blood-pressure which is not in correspondence with healthy records. If there be a rise of 10 beats from the lying to the sitting, and probably 10 more from the sitting to the standing position, there will be in many cases a corresponding drop of about 6 points from the lying to the sitting, and 6 more points from the sitting to the standing position in the blood-pressure. In the 14 moderately advanced cases the inverse difference between the pulse-rate and the radial tension is still more noticeable in many of the cases. In the advanced, old chronic cases with much fibroid tissue changes and good resisting power, the variation in the pulse-rate in the three positions—lying, sitting, and standing—may be as great as in the early infected, active cases, but a decided difference in the blood-pressure is observable. A variation in pulse-rate in lying, sitting, and standing of 90, 102, and 110 respectively, may give a uniform blood-pressure of 120 in assuming either lying, sitting, or standing position.

Some paradoxical cases are found in the incipient and in the moderately

advanced, in which the pulse-rate in the three varying positions varies nearly in direct proportion to the blood-pressure, that is, that with the natural rise in pulse-rate from the lying to the standing position there is not a corresponding fall in blood-pressure (not inversely), but in many cases a corresponding rise (but directly) in arterial tension. Similar observations were made under the direction of Theodore B. Sachs, at the Edwards Sanitarium at Naperville, Illinois, Department Chicago Tuberculosis Institute.

In many of the suspected tuberculous in which the clinical picture points strongly to a pulmonary tuberculous involvement, even before a physical examination is made, a fair diagnosis can be made by blood-pressure and pulse-rate alone. With a fairly rapid but weak pulse in the lying, faster in the sitting, and still faster in the standing posture, a pronounced tachycardia, an arterial tension which is best with the patient in the recumbent, not so good in the sitting, and much poorer in the upright position, a fairly positive diagnosis of pulmonary tuberculosis can be made. If to this be added an elevated temperature, loss of weight, a poor appetite, cough, and like symptoms, a positive diagnosis from such blood-pressure findings and pulse-rate records can be made without any physical examination of the chest.

SUMMARIZING

1. Blood-pressure and pulse-rate in the tuberculous is only a symptom, and not a part, of the disease.

2. Lowering of the blood-pressure may be interpreted as an early symptom of the tuberculous infection, even before the physical signs or even before elevation of temperature may be definitely demonstrable.

3. The toxemia in the tuberculous, with its accompanying cardiac atrophy and degeneration, seems to favor hypotension and tachycardia, and concomitant vasomotor dilatation and a low blood-pressure, whereas even with a moderate toxemia in the tuberculous, with a relatively large heart, a better development of the left ventricle will favor normotension or hypertension, and consequently a high blood-pressure.

4. Tuberculous patients with high blood-pressure, even though the cause of the increased pressure was an arteriosclerosis primarily or secondary to a chronic nephritis, do better than patients with subnormal or hypotension (Haven Emerson).

5. The tuberculous subject suffering from vasomotor dilatation induced by the circulating toxins in the blood—anything which will cause a contraction of the arterioles will increase vascular tension; hence vasomotor pressor remedies may be given, the first and foremost of which is rest.

6. Lowering of the blood-pressure in the active tuberculous may be a conservative act of nature—may be compensatory. Is it advisable to raise the pressure by the administering of blood-pressure-raising drugs? Would it be beneficial or harmful?

7. A favorable prognosis may be expected if, during the treatment of the tuberculous, the blood-pressure obtains a steady and uniform rise, approaching nearer the normal as the disease is being arrested.

8. The taking of the blood-pressure on the tuberculous patient in but one position is faulty, and will not lead to proper deductions, consequently a change of position from the lying to the sitting and to the standing should be made while taking the pulse-rate and making proper blood-pressure observations.

TABLES SHOWING THE COMPARATIVE DIFFERENCE IN THE PULSE-RATE AND BLOOD-PRESSURE IN THE VARIOUS STAGES OF PULMONARY TUBERCULOSIS AS WELL AS SOME NON-TUBERCULOUS CASES

FAR-ADVANCED CHRONIC AMBULATORY

Name	Age	Temp.	Weight	Pulse, Lying	Blood-Pressure	Pulse, Sitting	Blood-Pressure	Pulse, Standing	Blood-Pressure
Mrs. W....	30	101°	99¾	88	120	94	120	104	116
Mr. B.....	43	98.6°	102½	98	138	114	136	118	142
Mr. B.....	58	98.2°	129½	90	120	102	102	110	120
Mr. Z.....	30	100°	130½	78	96	84	98	90	88

PARADOXICAL (INCIPIENT AND MODERATELY ADVANCED)

Mr. J.....	41	99°	130	82	128	86	146	90	152
Mr. L.....	22	97.8°	121	98	96	108	106	120	102
Mrs. D....	30	98.4°	114	88	108	88	120	94	122
Mrs. H....	34	99.4°	105	78	100	86	106	90	110
Mr. P.....	37	100°	122½	108	104	96	92	98	96
Mrs. J.....	38	99.6°	105½	..	..	94	120	106	130
Mr. E.....	?	98.6°	?	84	124	90	130	112	140
Mr. O.....	16	98.4°	131	78	100	84	118	100	104
Mrs. D....	29	98°	116	70	120	78	118	82	124
Mr. W....	22	99.2°	123	70	100	78	108	84	106

MODERATELY ADVANCED

Miss B....	30	100°	?	94	104	104	98	108	90
Mrs. F....	42	99.2°	77	92	132	102	122	114	118
Mr. K.....	20	100°	?	102	108	120	104	140	90
Mrs. H....	32	98.8°	86½	102	108	118	96	124	88
Mr. Z.....	22	102.4°	122½	86	114	106	90	118	80
Mr. W....	30	97.6°	113½	98	118	114	116	120	114
Mr. H.....	22	100.5°	?	90	112	108	110	116	100
Mr. K.....	42	98.8°	116½	90	112	85	110	102	96
Mr. Z.....	24	?	?	92	98	100	85	110	88
Mrs. B....	30	101°	117	82	112	98	100	102	108
Mrs. T....	32	100.6°	?	94	106	100	104	116	92
Mrs. D....	40	98.8°	?	96	110	120	126	128	118
Mrs. F....	47	100°	?	90	104	92	102	104	94
Mr. S.....	46	99.4°	154½	86	122	96	126	106	120

INCIPIENT CASES

Name	Age	Temp.	Weight	Pulse, Lying	Blood-Pressure	Pulse, Sitting	Blood-Pressure	Pulse, Standing	Blood-Pressure
Mrs. K....	34	99.2°	119	104	116	110	120	116	114
Miss L....	16	?	?	92	110	110	112	120	100
Mr. M....	38	N.	138	90	110	98	106	102	96
Miss H....	22	98.8°	..	80	120	92	110	100	110
Miss C....	27	98°	116¼	80	114	78	110	100	100
Mr. M....	19	100.4°	?	76	112	86	108	100	100
Mrs. K....	34	99.2°	119	98	88	104	98	108	98
Mrs. K....	34	99°	121	96	102	108	102	108	102
Mr. F.....	29	98.6°	145	88	110	90	108	104	88
Mr. H.....	30	99°	166¼	66	142	70	140	74	136
Miss D....	17	98.4°	108½	76	96	84	94	104	90
Mr. W....	28	98.4°	127½	68	120	74	108	84	104
Miss N....	20	99°	?	84	104	94	100	102	104
Mr. P.....	19	98.8°	141½	82	128	96	126	108	116
Miss P....	15	98.8°	124	84	118	88	108	96	100
Mrs. B....	27	99°	128¾	82	94	96	86	108	76
Mr. N.....	24	99.2°	123	112	118	118	108	120	110
Miss R....	?	?	?	84	120	96	112	110	114
Mr. C.....	28	102°	138½	92	112	100	104	120	84
Mr. C.....	28	N.	138½	72	114	88	100	96	96
Mr. M.....	27	99.2°	?	72	136	72	130	86	130
Mrs. S....	28	97.2°	120	72	94	88	104	98	98
Mrs. W....	33	97.8°	..	120	118	128	112	136	110
Miss K....	36	99.8°	?	108	132	102	112	114	110
Mrs. N....	31	98.6°	?	88	104	96	114	104	98
Mr. W....	35	96.8°	?	96	126	106	116	126	122
Mrs. L....	26	99°	?	108	130	116	132	126	122
Miss C....	..	99°	85¾	106	120	104	122	124	112
Miss L....	34	97.8°	..	74	128	80	124	86	94
Mrs. C....	24	97°	105	80	98	88	96	106	92
Mr. W....	23	98.6°	118	108	124	112	124	116	118
Miss W....	32	97.8°	116	90	124	100	100	100	110

NON-TUBERCULOUS

Mr. B.....	20	98°	140½	84	132	84	124	86	130
Mrs. R....	26	99.2°	137	110	118	102	120	112	108
Mr. E.....	24	98.4°	175½	88	120	84	138	90	136
Mrs. F....	21	99.6°	150¾	74	122	74	120	96	116
Miss J.....	22	99°	128½	100	118	102	112	104	108
Mrs. R....	24	?	?	70	100	72	96	84	96
?	?	?	?	60	124	72	130	80	130
Mr. W....	?	99°	?	72	124	78	120	82	118
Mr. G.....	20	98.2°	?	76	110	80	114	84	116
Mrs. B....	26	98.6°	125	86	102	88	102	90	102
Mrs. B....	30	99°	129	68	112	78	104	78	104
Mr. M....	34	99.6°	132	90	114	92	116	92	122
Mr. E.....	30	100.4°	128¼	72	114	80	110	92	102
Miss W....	15	98.8°	78	92	120	96	110	100	110

DISCUSSION ON DR. RITTER'S PAPER

Dr. L. S. Peters, Silver City, New Mex.: I have been very much interested in this paper because it seems to confirm the findings of Thayer and Emerson and other observers in relation to blood-pressure at low elevation. Dr. Bullock and I, in the past five years, have worked out blood-pressure observations at an elevation of 6000 feet. We find that they differ from the blood-pressure findings at lower elevation. Our work was done with the patients in the sitting position, with the left arm flexed at the elbow and cuff applied about the level of the heart. We found the blood-pressures averaged about 25 mm. of mercury higher than those of Thayer or Emerson taken at sea-level. His average was 100 for tuberculosis cases. I would like to know Dr. Ritter's averages. Do you know, Dr. Ritter?

Dr. Ritter: I did not observe.

Dr. Peters: Probably 110. Even at that, our pressures were considerably higher at those elevations than at sea-level.

With relation to the different stages of the disease, we worked them out, and found that it does not make much difference whether a patient has incipient or far-advanced tuberculosis, provided there was not a great deal of fever. In the low-pressure cases there was marked toxemia, with high fever, and it is true that the inverse ratio of the pulse and blood-pressure holds good in such cases. If we have a case with high fever, the inverse ratio is marked. But in our observations we did not find a constant relation between the blood-pressure and pulse-rate in the ambulant cases. We could not see that there was any relation between the pulse-rate and blood-pressure in such cases.

Recently, in Paris, there were reported before the French Academy some aviation experiments in blood-pressure which would seem to bear out a statement of ours as to the increase in blood-pressure in high elevations. The blood-pressure was taken before the ascent and directly after the machine reached the ground. They found that the aviator took about one-half hour in his ascent to reach an elevation of 5000 feet. The descent was made in from five to ten minutes. The pressure upon reaching the ground following a rapid descent, before the body could accommodate itself to the sudden change, was markedly higher than before the ascent, which proves again that the blood-pressure is increased with elevation.

I mention these different things because heretofore people have believed that blood-pressure was reduced in high altitudes. Blood-pressure is

reduced when a person first enters an elevation, but that is only a temporary reduction, and within three or four days the pressure begins to rise again. That explains possibly the fact that patients having hemorrhages at low levels find that these hemorrhages stop upon their arrival at an elevation, such as we have at Silver City or any other portion of the southwest.

I would like to ask Dr. Ritter if he has taken blood-pressure records in hemorrhagic cases. We have done a little work on that line, but we have so few hemorrhages in New Mexico that we have not had an opportunity to study it in any number of cases. We have noticed that immediately upon a hemorrhage ensuing the patient's blood-pressure was raised from the one previously recorded to about 20 mm. on an average. Whether that rise occurred before the hemorrhage or not we were not able to say. We would expect it to occur, and would think that it might be the cause of hemorrhage, but we were unable to take blood-pressure observations before the hemorrhage occurred. It would be interesting to know whether, in the hemorrhagic cases, blood-pressure was markedly increased from the time when the doctor made the record. I also recorded the blood-pressure of normal individuals in order to keep account of the effects of altitude in normal cases. We found the pressure in individuals who were considered normal to average 142. That was higher than our averages for tuberculous individuals, and about the same difference in pressure one gets in normal individuals and consumptives at sea-level. The average in our cases is 128, all classes considered. I want to say a word about the prognostic value of blood-pressure in tuberculosis. We do not consider that, from a diagnostic standpoint, it amounts to much because we have high pressures. At sea-level it would be a good diagnostic sign. In improving patients the blood-pressure gradually rises. If a patient's condition is stationary, we do not observe a marked change in the blood-pressure. On the other hand, if the condition is progressive, the blood-pressure gradually drops. Our records show for discharged cases—apparent cures—an increase in pressure of 13 mm. of mercury, and in the arrested cases an increase of 13 mm. of mercury, whereas in the progressive cases there is a drop of 5 points.

I want to ask Dr. Ritter if he has records of average blood-pressures in the different stages. I would like to have these figures if he can give them to me.

Dr. William Charles White, Pittsburgh: I am sorry not to have heard Dr. Ritter's paper. I want to say a word or two in regard to the relation of blood-pressure to sweating. There are certain patients who sweat

in spite of better aëration; in these, during twenty-four hours, the blood-pressure runs down to a point very much below normal at about the time the sweating comes on at night. The night-sweats come on at about the same time that the blood-pressure runs down. If we merely raise the blood-pressure by making the patient stand on his feet, the sweating for that night may apparently be arrested, and while we could not determine much in certain of these cases, it seemed possible that there was something circulating in the blood that had to do with the blood-pressure at that period. For instance, when pilocarpin was injected subcutaneously, these cases went on to sweating for twenty-four hours continuously, so that we can conceive of the possibility of there being some circulating body in the blood-stream which has its action upon the sweat-glands of the body, but just how true that is we were not able to determine.

I would like to ask Dr. Ritter if he has any information to give us on the relation of the fall of blood-pressure to sweats coming on at specific times nightly.

Dr. A. G. Shortle, Albuquerque, New Mex.: These results are, to say the least, startling to me. My experience with blood-pressure findings is rather limited. The experience I have had has been with the patient sitting, and to find that the blood-pressure goes up when the patient is standing had not occurred to me. I would like to know the physiological reason for that if the doctor could give it. Theoretically, it might work, but practically we know it would not. Naturally, we would say it is better to stand the hemorrhagic cases up to lower the blood-pressure.

Dr. Frederick C. Smith, Fort Stanton, New Mex.: I have been surprised to learn from the remarks of Dr. Peters that, according to his blood-pressure experients, the records are higher at 6000 feet than have been previously reported at sea-level. That is not in accordance with the findings of the men who have done most work on this subject, and most of us would not consider the matter settled. Of course, it can be settled only by men working with the same instruments at different levels.

I recall the excellent work done by two men at Colorado Springs. They took individuals close to the top of Pike's Peak and made observations, and then made observations again after their descent. I have forgotten the names of the men who did this work, but I am under the impression they were Dr. Webb and Dr. Williams. Perhaps one of these gentlemen will give us their findings.

I differ from the gentleman's statement with regard to pulmonary hemorrhages. In New Mexico, at the Sanatorium there, conducted by

the United States Public Health and Marine-Hospital Service, we have had about 600 deaths from tuberculosis and 61 of these men died of pulmonary hemorrhage. The fact that treatment is of so little avail in severe pulmonary hemorrhage would lead one to believe that, unless there was some special predisposing cause, the mortality from pulmonary hemorrhage should be the same in all institutions, because I think we all admit that there is no special treatment which can be instituted in one place which would not be effective in the hands of another man. But the mortality is high from pulmonary hemorrhage. I have not been able to find any other institution where the mortality was 10 per cent. from pulmonary hemorrhage. Our altitude is 6280 feet. Certainly, hemorrhage is one of our most dreaded complications there.

Dr. L. S. Peters, Silver City, New Mex.: I do not believe any comparison can be made between institutions like that at Fort Stanton and private sanatoria. Your class of cases are not under the same régime as in private institutions, and the lives of the sailors, the dissipation that some of them go through, would tend to bring on hemorrhages. We have fewer hemorrhages in our institution in Silver City than other institutions, at lower elevations. Dr. Shortle believes that he does not have 2 per cent. of hemorrhages. The institution with which he is connected is another private one at high altitude. We figure that in an institution of 80 patients we have had on an average three hemorrhages a year, and we probably treat 200 or 300 cases a year—much less than Fort Stanton. Dr. Pettit, at the Ottawa Tent Colony, says that they have had 15 per cent. of hemorrhages.

Relative to the point regarding night-sweats. I have wondered if a decided increase in blood-pressure had anything to do with the stopping of night-sweats at high elevation. It is generally conceded that patients coming into high elevations soon lose their night-sweats. In fact, night-sweats are almost unknown. Patients will often sweat at sea-level, but on entering an elevated country the night-sweats will almost immediately stop without any medication whatsoever.

Dr. Ritter, Chicago: First, in regard to Dr. Peters' remarks about the taking of blood-pressure observations, I will state that they were all made by applying the armlet of the sphygmomanometer up as high as possible, and keeping the arm near the level of the third rib to get the pressure from the aorta directly. I tried in every case to take the blood-pressure of the patient, if in either lying, sitting, or standing position, by holding the arm on a level with the third rib.

Regarding hemorrhagic cases I must state that I have not had any experience. My experience has been largely with ambulatory cases. At Rush Medical College I have on my list over 2000 names of tuberculous, non-tuberculous, advanced,—in fact, all stages of the disease are under my care. I took the temperature, blood-pressure, and pulse-rate all at the clinics. These are not sanatorium but ambulatory cases. I cannot give, from the records of the cases, at the present time the blood-pressure and pulse-rate taken at the sanatorium at Naperville, Illinois.

Answering to the question of blood-pressure and pulse-rate in the sweating subject, I must say that I do not know, hence I am unable to inform the doctor.

Speaking about the blood-pressure and the pulse-rate in the tuberculous, they are changed in inverse proportion. This is also evident in health. You can readily determine this on a healthy subject, only it is more pronounced in the tuberculous, the variation is greater. If you take the pulse-rate of a healthy person while lying down, it may be say 67 or 68. Now, if you take it when the individual is standing up it may be 70 or 72, and you will find the blood-pressure will vary in the same way, but inversely. This variation is also in the tuberculous, only in much greater proportion. In health there is a greater blood-pressure on lying down than on standing, in the tuberculous patients there is more variation. It is intensified. There is more of a difference, a greater variation, and this is the point that I wish to make.

STUDIES ON MIXED INFECTION IN PULMONARY TUBERCULOSIS. THE ISOLATION OF THE STREPTOCOCCUS AND PNEUMOCOCCUS FROM THE BLOOD*

By Roswell T. Pettit, M.D.
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The rôle played by the organisms of mixed infection, especially the streptococci, pneumococci, and staphylococci, in chronic pulmonary tuberculosis is by no means a settled question. Some observers believe the tubercle bacillus is responsible for all the pathological changes induced, while others contend that the tubercle bacillus is of little importance and the organisms of mixed infection are responsible for practically all the damage done. Between these two extremes are those who assign a certain import to each the primary and the secondary infection, some believing the primary, others the secondary, infection plays the major rôle. This disparity of views of different observers is clearly shown in the report of the Committee on Mixed Infection of this society, presented in 1906–07.

Lawrence T. Flick, Lawrason Brown, T. M. Pottenger, and C. Y. White presented a majority report, stating that they believed mixed infection in tuberculosis a symbiosis of other micro-organisms with the tubercle bacillus in the tissues of body, either in tubercle itself or outside of the tubercle, in the parenchymatous tissue, intracellular tissue, in a mucous membrane, or in a serous membrane. The secondary organism, they believe, may fraternize with the tubercle bacillus or merely coexist with it. They are of the opinion that it is possible that the secondary invaders may repress or stimulate the growth of the tubercle bacillus, and it may be that the secondary infection has no effect upon the tubercle bacillus. Mixed infection plays an important rôle in tuberculosis, and gives rise to the symptom-complex known as consumption.

Arnold C. Klebs, not being able to agree with all the statements of the majority report, gave a minority report stating that he believed the tubercle bacillus itself and its products are capable of producing fever in various

* Work done under the Max Pam Research Fund.

degrees, according to its virulence, and that the bacteriological findings in the sputum have no relation to the clinical picture, even in well-marked intercurrent infections. The hectic fever may be pyogenic, but he is not certain, nor has he been able to convince himself, that the streptococcus, pneumococcus, and Diplococcus semilunaris have a specific effect upon the pathology of tuberculosis.

Bullock, not being able to agree with either Klebs or the majority report, stated that he has no definite idea as to the entity of mixed infection, but considers the clinical picture of consumption—night-sweats, febrility, peculiar skin odor, and emaciation are due to mixed infections. He believes the most damaging results are caused by the tubercle bacillus, and welcomes the appearance of organisms of mixed infection in sputum.

The disparity in views of investigators in this field is due very largely to the inaccuracy and inadequacy of the methods used in the investigation of the problem. Practically, seven different methods have been employed in the study: (1) Clinical study; (2) sputum examination; (3) postmortem bacteriological and anatomical examination of the lung; (4) animal experimentation; (5) study of the leukocytes; (6) the opsonic index; (7) blood cultures—(*a*) during life and (*b*) after death.

Clinical study gives no definite information; all the symptoms usually attributed to mixed infection, such as high and irregular fever, chills, sweats, profuse expectoration, emaciation, etc., have been observed in cases showing only tubercle bacilli in the sputum and no secondary organisms after death. Pick[1] has pointed out that the steep temperature-curve, attributed to secondary infection by Cornet[2] and Petruschky,[3] has been observed in cases showing only tubercle bacilli in the sputum and no secondary organisms in the tissues after death. On the other hand, cases showing pronounced cavities with many secondary organisms in the sputum show no fever whatever, but feel perfectly well (Sorgo[4]).

Sputum examination, which has also been used in the study of this problem, is unsatisfactory—all the organisms of mixed infection in tuberculosis are found in the normal mouth, pharynx, and trachea, and the results obtained by the examination of the unwashed sputum are of little value in determining the pathological significance of organisms there present in conjunction with tubercle bacilli. But little more weight can be given to results obtained from examinations of washed sputum, although the results of Kitasato, Petruschky,* Spengler, Schabad, and Cornet desig-

* These investigators took sputum soon after it was expectorated and washed it at least six times in sterile water or salt solution, but Sorgo says this amount of washing is inadequate, and according to his stringent rules mixed infection is much more rare than the above observers are led to believe.

nate the streptococcus as the secondary organism most constantly recovered.

Postmortem bacteriological examination of the lung is not convincing, because terminal, agonal, and postmortem invasion* are complicating factors of such frequency and extent.

The evidence contributed by animal experimentation is contradictory. Prudden[6] found that the inoculation of tubercle bacilli into rabbits produced tuberculosis, but seldom caused cavity formation, but the intratracheal injection of streptococci into tuberculous rabbits caused decided cavity formation. Marmorek,[7] however, has been able to produce cavities by the use of pure cultures of tubercle bacilli if used together with large doses of tuberculin.

The leukocyte count, I believe, is of some value, but at best it is an indirect method, and where several organisms are present, gives no information as to which organism is causing the damage. The opsonic index in the hands of various workers has not led to uniform conclusions; its value in the diagnosis of secondary infection in pulmonary tuberculosis is yet to be determined by a more extensive application.

Another method that has been used in this problem is the study of blood cultures. Blood cultures made after death are not convincing, because of terminal, agonal, and postmortem invasion. It has long been recognized, however, that the finding of secondary invaders in the blood-stream in pulmonary tuberculosis during life would constitute most direct evidence as to the importance of the rôle played by such organisms, and blood cultures have, therefore, been repeatedly employed in attempts to show the existence of such a bacteremia. As in the case of other methods cited, direct contradictory results have been reported, but in this instance I believe the confusion in results is due to variations in the technic of applying the method, rather than to the method itself; and from a study of 130 cases of pulmonary tuberculosis, of which this paper is a report, I am convinced that the blood culture method gives definite positive proof that secondary invading organisms are present in the blood-stream of individuals afflicted with pulmonary tuberculosis, and that the organisms so present play an important rôle in the production of the symptom-complex.

Before proceeding with details of my own work it may be well to analyze briefly the results of previous attempts in this direction. Blood cultures

* The results of Ravenel (Henry Phipps Institute Report, 1909) show the importance of postmortem invasion in the study of the lung after death. Norris and Pappenheimer[5] believe postmortem examination of the lung gives no information whatever concerning the conditions in the living.

during life in the hands of early workers were of little value, because sufficient care in the prevention of contamination from the skin and air was not used. Later workers, using a more careful technic, drawing a larger quantity of blood directly from a vein under aseptic conditions, have been uniformly unsuccessful in recovering pyogenic organisms from the blood-stream. Tessier, Jochman, Panichi, Benohr, Reiche, Hewelke, Sittman, Hirschlaff, von Michaelis and Meyer, Fraenkel, Schroeder and Naegelsbach, Lasker and Lemierre* have made altogether approximately 920 blood cultures on 789 cases of pulmonary tuberculosis, and have been able to isolate organisms showing the characteristics of the streptococcus or pneumococcus in only 23 cases, or 2.5 per cent.†

From these results Jochman, Benohr, Reiche, and others have concluded that, if mixed infection is responsible for fever, chills, sweats, etc., in pulmonary tuberculosis, their action is due to soluble toxins being thrown into the general circulation from a localized area of infection, rather than due to a general bacteremic infection. The results of workers using this method of investigation are quite uniform, and their conclusions seem justified, but a historical review of blood culture investigations in other diseases shows that with the development of a more careful bacteriological technic there is a marked increase in the percentage of positive blood cultures, and at the present time, instead of considering typhoid fever and pneumonia as infections confined strictly to the lung or intestine, we now believe them to be general bacteremic infections with local expressions in either lung or intestine.

Because of the possibility that the negative results of these workers may have been due to an inefficient technic, rather than an actual absence of secondary organisms from the blood-stream, and because of the direct evidence furnished by bacteriological examination of the blood during life, I decided to use this method of attack in the study of mixed infections in pulmonary tuberculosis.

It was decided, *a priori*, that the most efficient technic would be one in which—(1) a large quantity of blood was drawn, (2) under conditions eliminating contamination from the skin as nearly as possible, and (3) cultivating the organisms in an environment as little different from the conditions under which they had been living in the human body as possible.

* For review of literature on blood cultures in pulmonary tuberculosis see Jour. Infect. Dis., vol. ix, 237.

† Staphylococci are omitted from the summary results of previous workers because of the possibility of skin or air contamination.

Several methods of skin sterilization were used, but none was found more efficient than scrubbing with alcohol.* The blood—15 to 20 c.c.—was aspirated directly from a vein and cultivated in bouillon, and agar, and some of the undiluted blood was incubated in sterile test-tubes. After eighteen to forty-eight hours the cultures in bouillon were plated in blood-agar, individual colonies isolated and transferred to blood-agar slants after twenty-four hours' incubation, and, after eighteen to twenty-four hours, subcultures were made from the blood-agar slants to plain agar, potato, gelatin, litmus milk, dextrose agar, and serum inulin agar (Ruediger) or serum inulin water (His).†

Only organisms showing the characteristics of the streptococci or pneumococci—scant, dew-like growth on blood-agar, little or no growth on plain agar, no visible growth on potato, acidity, with or without coagulation in milk, but without liquefaction of the curd, little or no growth in gelatin without liquefaction, little or no growth in dextrose-agar stab cultures without gas-formation, and scant growth in bouillon of Gram-positive cocci in pairs or chains—were considered.

Any culture showing extensive white growth on blood-agar, moderately extensive white or yellow growth on plain agar, visible growth on potato, liquefaction of gelatin or growth of round Gram-positive cocci in bunches in bouillon was considered a staphylococcus, and discarded as a contamination from the skin or air.‡

One hundred and thirty cases were examined, and either the streptococcus or pneumococcus was recovered from the blood in 60, or 46 per cent. The streptococcus was found in 36 cases, and the pneumococcus in 24 cases.

The results are tabulated as follows:

* In a number of cases the skin of the cubital region was scrubbed thoroughly with green soap, and rinsed with 5 per cent. carbolic acid and 1 : 1000 mercury bichlorid. In another group of cases the cubital region of the patient's arm was scrubbed with green soap and painted with iodin. The percentage of cases showing Staphylococcus albus after these methods of skin preparation was as great as in cases in which scrubbing with alcohol was used.

† For detailed description of technic used and characteristics of organisms isolated see Jour. Infect. Dis., vol. ix, 237.

‡ The differentiation of the streptococci from the pneumococci, in so far as that is possible, was made on the following criteria: (1) Reaction on blood-agar plates; (2) chain formation on blood-agar and in bouillon; (3) reaction in serum inulin agar or in serum inulin water; (4) growth in gelatin, capsule formation, growth on plain agar, and morphology were not considered of especial diagnostic importance, but were used in making the differentiation. Even with this large number of criteria it was frequently hard to determine whether an organism should be classed with the streptococci or pneumococci.

TABLE I

	Number of Cases Examined	Positive Blood Cultures	Percentage of Positive Blood Cultures
Incipient,	12	2	16⅔ per cent.
Advanced,	99	45	45 " "
Far advanced,	19	13	68 " "
Total,	130	60	46 " "

An analysis of the above table shows that positive blood cultures were obtained in a relatively small number of cases classed as incipient, whereas the percentage was almost three times as great among the advanced cases, and the percentage of positive results among the far-advanced cases was half again as great as in the advanced cases, and more than four times as great as in the incipient cases. Fifty-eight of the 60 positive cultures were obtained from advanced and far-advanced cases.

These results, I believe, show that mixed infection is an important factor in pulmonary tuberculosis, and that the secondary infection is not a local one confined to the lung, but is a general bacteremic infection.

That the presence of the streptococcus and pneumococcus in the blood is important in the symptom-complex of chronic phthisis is not only shown by the steady increase in the percentage of positive blood cultures in the various stages of the disease,—16 per cent. in the incipient stage, 45 per cent. in the advanced, and 68 per cent. in the far-advanced stage,—but that the activity of the disease is in part due to the pyogenic bacteremia is shown in the accompanying table (Table II). Pyogenic bacteremia is nearly twice as frequent in cases with afternoon temperatures above 100° F. as in cases with afternoon temperatures below 100° F.

TABLE II

Cases with Temperatures above 100° F.	Number of Positive Blood Cultures	Percentage of Positive Blood Cultures
65	37	58 per cent.
Cases with Temperatures below 100° F.	**Number of Positive Blood Cultures**	**Percentage of Positive Blood Cultures**
65	22	34 per cent.

Twenty-three of the 60 strains isolated were tested as to their pathogenicity for mice. Approximately, 1 c.c. of a twenty-four-hour milk culture was injected subcutaneously into a 15-gram mouse. Of the 23 strains tested, 16, or 66 per cent., were lethal. Fifteen of the 60 strains isolated were employed also in conjunction with the homologous sera, to determine whether or not the presence of the organism in the blood-stream had modified the opsonizing value of the serum. In the case of 10 of the 15 sera so em-

ployed (66⅔ per cent.) the opsonic index for the homologous organism was abnormal, namely, below 0.8 or above 1.2. The usual Wright technic was used. The values obtained in the several instances are given in the following table (Table III):

TABLE III

No.	Organism	Opsonic Index
1	Streptococcus	0.85
2	Pneumococcus	1.30
3	"	0.70
4	Streptococcus	0.95
5	Pneumococcus	0.50
6	"	0.70
7	Streptococcus	0.80
8	Pneumococcus	0.75
9	"	0.50
10	"	1.30
11	Streptococcus	0.80
12	"	0.75
13	"	0.70
14	"	0.80
15	"	0.70

These results, I believe, indicate a causal relationship existing between the host and the parasite.

Could it be demonstrated that the streptococci and pneumococci obtained in the above results have a possible source in skin, air, or other contamination, as is actually the case with the staphylococci, for instance, the above findings would have no bearing on the discussion of secondary infection in pulmonary tuberculosis.

Hektoen[8] has pointed out, however, that contaminations with the streptococci and pneumococci in venous puncture blood cultures are of such rare occurrence as to be a negligible factor. Rarely is it possible to obtain streptococci by direct inoculations from the skin, even in the absence of surface sterilization.

Weaver,* attempting to cultivate this organism from the skin in a group of 18 cases, was successful in but one case, and Dreyer,† in a similar group of 30 cases, failed to cultivate the streptococcus in a single instance. To control this point under fully parallel conditions, however, blood cultures were made on 21 normal individuals, employing exactly the same technic as that used in making blood cultures on the 130 cases of tuberculosis reported on. Neither the streptococcus nor the pneumococcus was found in a single instance, whereas the Staphylococcus albus was present in 2 cases.‡

* Cited by Hektoen.[8] † *Loc. cit.*

‡ The skin of the forearm of six normal individuals was entered with sterile needles. These needles were then plated in blood-agar. In two instances there was a growth of Staphylococcus albus, the remaining four plates remained sterile.

In view of these facts the conclusion seems warranted that the pneumococci and streptococci isolated by the blood culture method used in the present instance had their origin not in some extraneous source, but actually in the circulating blood.

The high percentage of positive results in the series of cases here reported contrasts, to be sure, sharply with the results of previous workers who have employed the blood culture method in studying secondary infections in pulmonary tuberculosis. The explanation of this difference I do not seek to establish, other than to point out that in the present series—(1) a large number of cases were examined; (2) a large amount of blood was used; and (3) cultural conditions most favorable to the growth of the organism in question was maintained. The isolation of the pneumococcus and streptococcus from the blood-stream in nearly half of the 130 cases examined leads me to the conclusion that not only are true secondary invading organisms of frequent occurrence in pulmonary tuberculosis, but, further, that in many instances these organisms, entering the blood-stream, constitute a complication of extensive pathological significance.

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SECONDARY INFECTIONS IN PULMONARY TUBERCULOSIS (A STUDY BASED ON SPUTUM EXAMINATION)*

By James L. Whitney, M.D.
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There are few beliefs more firmly grounded in the mind of the average practitioner than that of the frequency and importance of secondary infections in pulmonary tuberculosis. In this belief he is following distinguished authority. Cornet, in Nothnagel's "Handbuch," speaks very emphatically on the subject, believing that almost every ulcerating case owes many of its symptoms to the secondary invader. The belief that softening takes place only by means of a coccus seemed to have been proved by Prudden's well-known experiment, and the typical "septic" curve, which the temperature assumes at this stage in the pulmonary case, seemed to complete the proof, until Marmorek showed that softening may take place in the presence of Koch's bacillus alone, and the type of the reaction to tuberculin, as well as the septic type of fever in tuberculosis elsewhere, has weakened the latter argument.

The chief methods used in the study of mixed infection have been: (1) Examination of the sputum from the living, both by direct examination and much more often by cultures; (2) by histological and cultural methods postmortem; (3) by blood cultures; (4) by serum tests, such as opsonin determinations. Cornet's work on the subject was done largely by postmortem studies, though many cultures were made from "living" sputum. Spengler[1] employed careful direct examination of the sputum, cultures made with a technic which he rightly insisted upon, and followed this in fatal cases with the same procedures on the postmortem material. His figures show a high percentage of secondary infection, and many of his cases are entirely convincing. Out of 50 cases, he found 7 without any secondary infection; 29 he considers as showing streptococcus; of these he himself calls 7 "passive infections," and of the remainder, while 8 seem unimpeachable, 21 are, in the present writer's opinion, open to some question. Of the

* From the Department of Medicine, University of California.

8 fairly certain streptococcus cases, 4 were fatal, the examinations being made not long before death.

The conclusions of many observers, especially the older ones, must be accepted with great caution, since their results are based on cultural examination of the sputum or postmortem studies. Norris and Pappenheimer[2] pretty thoroughly demonstrate the worthlessness of bacteriological studies on lungs from autopsy, on account of the readiness with which postmortem contaminations extend downward from the upper tract, and of the high incidence of agonal infections. Ophüls has shown the same facts. They believe, as well, that the older observers did not successfully differentiate the members of the pneumococcus-streptococcus group from each other. They show that 95 per cent. of normal persons give some member of this group in cultures from the saliva (figures which agree with those of other observers). It is probable that the failure to differentiate pneumococcus and streptococcus has not stopped with the older observers—for example, the streptococcus is given in most text-books at the head of the list of germs causing bronchitis. The writer's experience in sputum examination has been considerable, and he has yet to see his first case of Streptococcus bronchitis (except the Streptococcus capsulatus, which could not easily be confounded with the germ of Fehleisen). The method of cultural examination of sputum is, unless very carefully controlled, more than useless, since it leads to quite false conclusions. Apart from contamination with saliva, the bronchi, which receive a constant current of air passing through the nose and mouth, will certainly harbor here and there harmless bacteria showing in cultures, while the pathogenic flora of the lung is in many instances overlooked on account of its slight growth or failure of growth on ordinary media. As to the other methods mentioned, opsonic determinations have as yet shown nothing; blood cultures have rarely been obtained except shortly before death.[3]

More recently observers have been finding lower percentages of mixed infection. Ravenel reported 3 cases of cavities without secondary infection. Ophüls reports 7 sterile out of 13. One of the best recent articles is by Sorgo.[4] Of 30 not fatal cases, 26 were sterile; and of 19 fatal cases, 13 showed only tubercle bacilli. The organisms in the 10 cases which showed them at all were various, and in some cases evidently not pathogenic. He had one case of undoubted severe streptococcus infection. His methods were cultural, with the most exaggerated precautions in washing the sputum, etc.

I have for some years been surprised that a procedure to demonstrate the presence or absence of secondary infection, which is not only the simplest,

but also, I believe, the most reliable, has been almost wholly neglected. I refer to a careful direct examination of the fresh sputum. Having by experience convinced myself that a genuine secondary infection of the lungs, except in the sense of a "cold," such as normal and sick people are alike exposed to, is much rarer than is ordinarily believed, I have determined to collect the reports of the last 100 sputum examinations which have shown tubercle bacilli. The only selection has been the omission of certain cases where the sputum was not fresh enough for judgment as to secondary organisms, or when the records were not sufficient in some other particular. Of these 100 cases, 22 are from private practice, 14 from the chronic cases at the San Francisco City and County Hospital, 64 from the ambulatory cases of the dispensary of the San Francisco Tuberculosis Association.

First, as to technic. If possible, I have the patient expectorate into the receiver in my presence. This insures freshness, and also avoids soiling with hawkings from nose or mouth. That the specimen should be fresh I consider of the highest importance, since a sputum much over six hours old is often either overgrown by other bacteria, or is so softened by autolysis as to be quite useless. The sputum is placed in a 6-inch Petri dish, and with two wooden "applicator" sticks, or one stick and a pair of forceps, the best particle is carefully selected, brought to one side, rolled over and over on the dry glass, to which the outer covering of saliva, etc., adheres, until the very center of the particle is reached. Rolling on a piece of filter-paper is often useful. This particle is transferred to a cover-slip (never a slide), and with another cover-slip two smears made like blood-smears. One of these is stained for tubercle bacilli, applying aqueous methylene-blue for a second as counterstain. (Loeffler's blue often stains the tubercle bacilli.) The other slip is preferably stained by the method elaborated by W. H. Smith,[5] though for a negative report staining with Loeffler's blue is sufficient. The second cover-glass should never be omitted, as most organisms stain feebly or not at all with aqueous methylene-blue. Washing of the sputum I have entirely abandoned, since the cleansing is more efficiently performed in the manner described. In washing, a purulent sputum goes to pieces; a mucoid one is either almost unaffected, or ravels into particles which are difficult to manage.

The reason that I call this method more reliable than the cultural method is that an organism is often seen to be in enormous numbers in the sputum, and yet, like the influenza, may easily escape detection in cultures. Again, the streptococcus and pneumococcus as they occur in animal secretions are readily distinguished by appearance alone, while the differentiation in

cultures is very tedious or impossible. Practically all the bacteria important in this connection may thus be identified by direct inspection, controlled, if desired, by cultures. Again, after a little practice, it is usually possible to differentiate bacteria which are active from those of the same species which are accidentally there. The latter are likely to occur in groups, not scattered intimately among the pus-cells, usually in connection with buccal or pharyngeal cells, and never inside leukocytes. Many bacteria have a quite different appearance under these circumstances—the Micrococcus catarrhalis is very large; the pneumococcus either small or large, often in chains, and lacking its capsule.

The results of this tabulation are very simply stated. Of 100 cases, 96 showed no evidence of secondary infection by sputum examination; 2 showed large numbers of influenza bacilli, which from the history seemed to represent a "chronic influenza," that is, a bronchitis; 1 showed numerous pneumococci, which seemed to be a "cold" or acute bronchitis; and one case showed large numbers of typical streptococci, often intracellular, thoroughly scattered through the cells, among which the tubercle bacilli were found in enormous numbers. From this sputum the streptococcus was isolated in pure culture. This last case is interesting, not only as being the only streptococcus infection in these 100 cases reported, but as being the first case of the kind ever seen by the writer. Unfortunately, the patient was seen only ten days ago, and aside from a blood culture which proved negative, further observations were impossible. The patient is a girl of seventeen, a far-advanced case with afternoon temperature of 102.5°, and in poor general condition. She had at the time a tonsillitis, with a suggestion of pseudomembrane—this may have had a connection with the streptococcus from the lung. The other three secondary infections were in far-advanced cases, all ambulatory, and without much temperature derangement.

Of the 96 negative cases, 26 were "incipient"; 21 "moderately advanced"; and 49 "far advanced," by the National Classification. Eighteen had recognizable physical signs of cavities. Sixteen had no temperature; 47 slight; and 33 the typical "septic type," with morning remissions, chills, and sweats. The sputum from 2 negative cases was obtained during large hemoptyses.

As to the matter of "colds." It is to be expected that a tuberculous patient will "catch cold" about as often as the normal person, probably not oftener. When this happens, as in the case above, the organism responsible will be found in the sputum. In another case here listed as negative I found the sputum loaded with influenza bacilli during a "cold"—previously

only tubercle bacilli had been found, and again two weeks after the "cold" the sputum was again free from secondary invaders.

Comparing the results here detailed with those of the last paper, we find a total divergence. Dr. Pettit is able to demonstrate a bacteriemia in a larger proportion of cases than has any observer heretofore whose technic has been beyond criticism, while the present writer confirms the results of the best recent work, such as that of Sorgo, to the effect that examination of the sputum, direct or cultural, even when known to come directly from cavities, will, in a large proportion of cases, be found sterile except for tubercle bacilli. We are then confronted with two facts which demand reconciliation—first, that a large number of tuberculous patients show a bacteriemia; second, that the same patients will usually not give evidence of this infection, either by direct or cultural examination of the sputum or the contents of cavities. What is the explanation? One which suggests itself is that the secondary bacteria, though situated in the lung, may not escape into the sputum, as sometimes the cavity of a pus-tube is found to be sterile. This is certainly possible, but seems hard to believe. Is it not possible that we have in these cases a bacteremia, that is, a blood infection, without local lesion in the lung, referable to the germ in question? We know too little as yet as to the meaning of bacteremia to make positive statements as to its origin. It is known that a positive blood culture may be obtained with good technic much oftener than has been supposed—pneumococci are found in the blood during a severe cold, staphylococci during an attack of boils. We have no data as to the virulence for the human being of these strains recovered. Is it not possible that we may have, in debilitated patients, bacteria circulating in the blood which represent no local infection, and which in some cases may be regarded as casual invaders? The writer has found a few pneumococci on direct examination of a spinal fluid from a case of tuberculous meningitis. Here the pneumococcus had given no evidence of activity, and he was led to wonder at that time whether a germ whose power of virulence may be low, like the pneumococcus, might not circulate more freely in the body-fluids than is usually supposed, especially in debilitated subjects, and in a more or less innocent way.

LITERATURE

1. Spengler: Zeit. f. Hygiene, 1894, No. 18.
2. Norris and Pappenheimer: Jour. Exp. Med., 1905, vol. vii, p. 450.
3. Panichi, however (Berl. klin. Woch., 1908, p. 1840) got a growth of pneumococcus seven months before death.
4. Sorgo: Zeit. f. klin. Med., 1907, p. 61.
5. Smith: Boston Med. and Surg. Jour., December 18, 1902; *ibid.*, November 24, 1910.

DISCUSSION ON PAPERS BY DR. PETTIT AND DR. WHITNEY

Dr. R. B. Homan, El Paso, Tex.: These two papers have been exceedingly interesting to me, for the simple reason that in my limited experience with tuberculosis I have met with quite a large percentage of cases of mixed infection. They had been diagnosed heretofore by examination of the sputum.

Dr. Pettit's technic has been of special interest to me. I had never made any investigations of the blood-stream for the mixed infection, and I hope that he will continue to carry out these investigations and will be joined by others, so that we may profit by this line of investigation.

I have one point to suggest, whether it is of any value or not I am not prepared to say, and that is, in my location we get patients both from the extreme north and the south, and I have noticed that the cases of mixed infection came much more from the northern States than from the southern States. In fact, the majority of mine have been from Pennsylvania, Iowa, Illinois, and Michigan.

Dr. Pettit, Ottawa, Ill.: In answer to Dr. Homan's suggestion, I may say that I have thought of climate as a factor in the production of secondary infection. Dr. Rosenow has found pneumococcemia in 90 per cent. of the cases of pneumonia he examined in Chicago. Dr. Strouse, at the Johns Hopkins Hospital in Baltimore, found only 40 per cent. of his cases of pneumonia showing bacteremia. The determining factor in this case was quite likely the differences in the technic employed, and in studies of this sort, where technic is so extremely important, wide variations in results are very likely to occur. However, pathogenic microorganisms, as well as other forms of life, are subject to the influences of geographic distribution—the Staphylococcus aureus is more frequent in some localities than in others; the pneumococcus is more frequently found in cities than in rural districts, and other instances might be cited.

I have had some correspondence with Dr. Webb, of Colorado Springs, in regard to this point, and hope that some time in the future I can come out to Colorado and make a series of blood-cultures and see if climatic conditions are a factor in the production of secondary infection in tuberculosis. An offhand statement, unsupported by experimental evidence, is of little value.

THE EFFECT OF TUBERCULIN TREATMENT UPON THE LEUKOCYTIC PICTURE

(A Preliminary Report)

By Myer Solis-Cohen, M.D., and Albert Strickler, M.D.

Philadelphia

(Read by Title)

At the last annual meeting of this Association we presented a report* of the first 12 cases of pulmonary tuberculosis whose leukocytes we studied. Five months later we read a paper† before the Philadelphia County Medical Society on the 50 cases we had examined up to that time.

From a study of 182 differential leukocytic counts made on these 50 cases we formulated the following conclusions:

1. Improvement in pulmonary tuberculosis is associated with an increase in the proportion of lymphocytes in the blood at the expense of the polymorphonuclear cells. As the patient gets worse the proportion of polynuclear cells increases at the expense of the lymphocytes. None of the other cells are affected by either process. As a rule, in consequence, the percentage of lymphocytes will be less and the percentage of polynuclears will be greater, the more advanced the disease and the greater the amount of lung tissue involved.

2. As a patient begins to improve there is usually an increase in the proportion of polynuclear cells containing one and two nuclei, the increase being often maintained for several weeks, but not indefinitely.

3. Mononuclear, transitional, and eosinophile cells are unaffected by the stage, extent, or progress of the disease.

4. The leukocytic picture in pulmonary tuberculosis corresponds with the patient's resistance to the disease, rather than with the extent of the lesion.

5. By means of the leukocytic picture it is often possible to estimate a tuberculous patient's resistive power, and to obtain a fairly accurate estimate as to his chances for recovery.

The following tables give the average proportion of each type of cell we found in the different groups, and the number of cases and blood counts on which the averages are based:

* "A Study of the Leukocytes in Pulmonary Tuberculosis—a Preliminary Investigation," Trans. Nat. Assoc. for Study and Prevent. of Tuberculosis, 1910, 308.

† American Journal of the Medical Sciences, Philadelphia, 1911, cxlii, 691.

	Number of Cases.	Number of Blood Counts.	Polynuclears.	Lymphocytes.	Mononuclears.	Transitionals.	Eosinophiles.	Arneth's I and II.
All stages	50	182	66	30	1.5	1	1.5	44.5
Stage I	13	46	62.5	33.5	2	0.5	1.5	44.5
" II	6	27	65	30.5	2	1	1.5	41.5
" III	31	109	68	28.5	1.5	1	1	44.5
Class I (Turban)	14	50	63	33	2	1	1	45.5
" II "	9	36	65.5	30	2	1	1.5	45
" III "	27	96	68	28.5	1.5	1	1	43.5
Apparently cured	5	24	61	35	2	0.5	1.5	43
Arrested	5	16	64.5	30.5	2.5	1	1.5	47.5
Improving	15	68	64.5	31.5	2	0.5	1.5	44
Stationary	9	30	69	28.5	1	0.5	1	32
Advancing	15	43	68.5	27	1.5	1.5	1.5	45

In the following table the patients in each stage have been grouped according to the progress of the disease:

	Number of Cases.	Number of Blood Counts.	Polynuclears.	Lymphocytes.	Mononuclears.	Transitionals.	Eosinophiles.	Arneth's I and II.
Stage I: Apparently cured	5	24	61	35	2	0.5	1.5	43
" Arrested	3	6	66.5	29	2.5	1	1	52
" Improving	5	16	62	34.5	1.5	1	1	42
Stage II: Arrested	2	10	61.5	33	2	1.5	2	40.5
" Improving	2	13	66.5	28	3	0.5	2	49
" Stationary	2	4	67	30.5	1	1	0.5	69
Stage III: Improving	8	39	65.8	30.4	2	0.4	1.4	46.7
" Stationary	8	27	68.5	29	1	1	0.5	43
" Advancing	15	43	68.5	27	1.5	1.5	1.5	45.5
" Capable	9	37	64.5	32	2	0.5	1	43
" Incapacitated	22	72	69.5	27	1.5	1	1	45.5
" Non-toxic	8	35	68	29	1	1	1	46.5
" Toxic	13	33	70	26	1.5	1.5	1	45

Although the average index showed little change, the proportion of cells in the first two classes of Arneth seemed, in most of our individual cases, to be increased as the patient improved, and in a number of cases to be diminished as the patient grew worse.

THE EFFECT OF THERAPEUTIC MEASURES ON THE LEUKOCYTIC PICTURE

The primary object of this investigation was to find some method of determining whether or not a given remedy is effective in a given case. Having established a means of observing graphically the variations in a patient's resistive power and of the progress of his disease, we studied the effect on the blood-picture of a number of therapeutic measures. The effect of Bier's hyperemia, cantharides blisters, creosote carbonate, iodoform, and nuclein we reported* last September to the Pennsylvania State Medical Society, arriving at the following conclusions:

In the differential leukocytic count we have a means of studying more exactly than in any other way the effect produced by therapeutic measures in patients with pulmonary tuberculosis. It is impossible to state definitely, however, whether the changes observed in the leukocytic pictures are produced directly in the blood, or result indirectly from the change in the general condition of the patient caused by the measure employed.

It would seem, from the few cases studied, that:

1. Bier's suction hyperemia in cases suitable for this treatment causes an increase in the proportion of lymphocytes and of polynuclear cells with one and two nuclei.

2. Applying fly-blisters every five days and allowing the serum to become absorbed causes an increase in the proportion of polynuclear cells with one and two nuclei, and in most instances an increase in the proportion of lymphocytes.

3. Iodin in the form of iodoform administered by the mouth causes an increase in the proportion of polynuclear cells with one and two nuclei.

4. Creosote, given in the form of the carbonate, causes an increase in the proportion of lymphocytes and of polynuclear cells with one and two nuclei.

5. Nuclein seems to cause an increase in the proportion of polymorphonuclear neutrophiles.

6. The effect produced in the blood by many therapeutic measures is not, as a rule, maintained indefinitely, but only for a variable period, averaging about a month.

* Boston Med. and Surg. Jour., 1911, clxv, 563.

THE LEUKOCYTIC PICTURE DURING TUBERCULIN TREATMENT

We are now studying the effect of tuberculin treatment on the leukocytic picture, and present in this paper a preliminary report on our first six cases.

The patients are classified according to the stage of the disease, as defined by this Association, the amount of lung tissue involved (Turban's classification), the progress of the case, and as to whether or not the patient is incapacitated and toxic. The leukocytes are divided into polymorphonuclear neutrophiles, which are grouped according to the number of nuclei they contain, lymphocytes (mononuclear cells whose nucleus occupies over half the cell), mononuclear cells (whose nucleus is smaller than the surrounding protoplasm), transitional cells (mononuclear cells with indented nucleus), and eosinophile cells. The one who made the counts has never seen the patients, knew nothing of their condition, and did not know when treatment was commenced or when the dose was increased.

Two children in a sanatorium who were given tuberculin by mouth in very gradually increasing doses showed a remarkable increase in the proportion of lymphocytes and of polynuclear cells with one and two nuclei. They were stationary cases in Stage II, Class I, and capable of working. An adult stationary and capable case in Stage III, Class III, in a sanatorium, who was kept on the same small dose by mouth for three months, showed first a marked increase of lymphocytes and later a very slight increase. The first two classes of Arneth showed, first, a moderate decrease and later a corresponding increase. Another adult stationary and capable case in Stage II, Class II, on the same dosage, showed first an increase in lymphocytes, followed by a greater decrease, and then, as the dose was augmented, by a still greater increase. The first two classes of Arneth showed first a decrease and then a regular increase. Two adult improving and capable cases in Stage III, Class III, under the care of Dr. Solomon Solis Cohen at the Rush Hospital, were given tuberculin hypodermically in increasing doses. In both there was a decrease in the proportion of lymphocytes and an increase in the proportion of polynuclear cells with one and two nuclei. The charts of all these cases are appended.

REVIEW OF THE LITERATURE

We have been able to find but two references to the blood-picture during tuberculin treatment. Hultgen* regards the leukocytic picture found in

* Hultgen, J. F.: "The Leukocytes in Incipient Tuberculosis, Their Use as a Guide in the Administration of Tuberculin," Trans. Chicago Path. Soc., 1909, vol. vii p. 199.

incipient pulmonary tuberculosis (polynuclears, 53 per cent.; small mononuclears, 41.5 per cent.; large mononuclears, 3.5 per cent.; eosinophiles, 3 per cent.) as identical with the post-infection picture seen in recovery from disease, a kind of auto-immunization—a desirable state of affairs. Why, then, he asks, not use this proportion among the leukocytes as a guide in the administration of tuberculin? Since the leukocytes are so manifestly sensitive toward noxa of any kind, chemical, toxic, and toxin infections, should they not show, by their changes, as to whether certain therapeutic agents are harmful or curative? He believes that the leukocytes respond readily invariably to any changes in the amount of antibodies in the circulation, that the blood-picture described develops under the use of tuberculin, but that deviation from this occurs when overdoses of tuberculin are given, with subsequent return.

Etienne, Remy, and Boulangier* studied the blood of five tuberculous patients, aged sixty to seventy-six years, probably in Stage III. The total number of polynuclear neutrophiles was often diminished for a short period of time immediately following the injection. There was an increase, however, in the cells with three or more nuclei. At the same time there was a corresponding increase in the total number of mononuclear cells, of which the lymphocytes were clearly increased, both in absolute number and in percentage. The large mononuclears, however, were diminished, and in three of the cases the small mononuclears were also diminished. After six months' treatment, however, the number of polynuclear cells was higher than at the beginning. In four cases it rose more or less rapidly to the maximum, from which it later descended, remaining, however, at the end of six months, higher than at the beginning. At this later stage also there was a notable increase in the polynuclear cells with three or more nuclei. The total number of mononuclear cells was always diminished at the end of six months, as was the number of large mononuclear cells. The lymphocytes were, however, increased, while the small mononuclear cells were increased in some patients and diminished in others. The eosinophile cells did not seem to be influenced in a definite manner by the action of tuberculin.

DISCUSSION OF RESULTS

From our six cases it is impossible to generalize or draw definite conclusions. The results in four of our cases, and especially in two, are certainly

* Etienne, G., Remy, and Boulangier: "Action de la tuberculine sur la leucocytose absolue chez les tuberculeux agés," Compt. rend. Soc. de Biol., 1909, vol. lxvi, p. 268. "Action de la tuberculine sur les polynucléaires chez les tuberculeux agés," *ibid.*, p. 270. "Action de la tuberculine sur les mononucléaires chez les tuberculeux agés," *ibid.*, p. 673.

suggestive. It is possible that the effect on the blood-picture will show what cases are suitable for tuberculin treatment and whether the dosage employed is correct, insufficient, or excessive. The age of the patient, the stage of the disease, and the amount of lung involvement may be factors in the effectiveness of tuberculin therapy and in the changes in the proportions of the leukocytes that result from it. When we have studied a sufficiently large number of cases, we hope to be in a position to speak with greater precision on these questions.

At present, without drawing any inferences, we can merely state that:

1. In all our cases there was an increase in the proportion of polynuclear cells with one and two nuclei during tuberculin treatment, in two cases, however, being preceded by a fall.

2. In four of our six cases the lymphocytes were increased during tuberculin treatment, a slight intermediate fall, however, occurring in one after three months on the same dosage.

3. Tuberculin given by the mouth in very small doses, very gradually increased, apparently produces an alteration in the proportions of the different forms of leukocytes.

We desire to thank Dr. Solomon Solis Cohen for permission to use two of his cases.

REPORTS OF CASES

Case I.—E. H., female, aged forty-two years, Stage III, Class III, stationary, capable, non-toxic, a patient of Dr. Solomon Solis Cohen at the Rush Hospital, Philadelphia. The patient was given tuberculinum purum hypodermically, commencing December 30, 1910, with a dose of 0.002 mg., the dose being doubled at almost each injection. The patient improved, gaining four pounds in a month. The blood was not examined until eighteen days after tuberculin treatment was begun. Two counts were made, with the following results:

	January 17, 1911.		February 16, 1911.	
Polynuclear neutrophiles	78%		89%	
" " with one nucleus	14%	61%	14%	66%
" " " two nuclei	47%		52%	
" " " three nuclei	38%		34%	
" " " four nuclei	1%	39%	0%	34%
" " " five nuclei	0%		0%	
Lymphocytes	21%		11%	
Mononuclear cells	0%		0%	
Transitional "	1%		0%	
Eosinophile "	0%		0%	

Case II.—A. M., aged twenty-nine years, female, Stage III, Class III, improving, capable, non-toxic, a patient of Dr. S. Solis Cohen at the Rush Hospital, Philadelphia. The patient was given tuberculin T.R. hypodermically, beginning January 21st with a dose of 0.0001 mg., each subsequent dose being increased by 0.0001 mg. The patient improved and gained three pounds and a half in one month. The blood was examined a few days before the first injection of tuberculin and one month later.

	January 17, 1911.		February 16, 1911.	
Polynuclear neutrophiles	83%		91%	
" " with one nucleus	11%	57%	10%	65%
" " " two nuclei	46%		55%	
" " " three nuclei	43%		35%	
" " " four nuclei	0%	43%	0%	35%
" " " five nuclei	0%		0%	
Lymphocytes	16%		9%	
Mononuclear cells	1%		0%	
Transitional "	0%		0%	
Eosinophile "	0%		0%	

Patients at Rush Hospital, Philadelphia (Service of Dr. Solomon Solis Cohen)

Case I, E. H., Stage III, Class III, Improving.

Given tuberculinum purum hypodermically in ascending doses.

Gained 4 lbs. in one month. General condition improved.

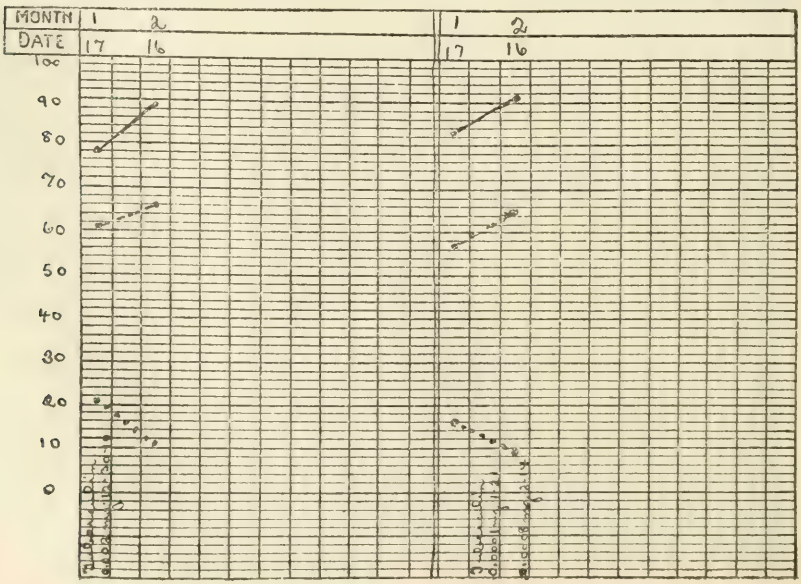
———=Polynuclears....=Lymphocytes.

Case II, A.M., Stage III, Class III, Improving.

Given tuberculin T. R. hypodermically in ascending doses.

Gained 3½ lbs. in one month. General condition improved.

— — — —=Classes I and II of Arneth.



Case III.—G. N., aged forty-one years, female, Stage III, Class III, stationary, capable, non-toxic, a patient of one of us at the Home for Consumptives, Chestnut Hill, situated about 500 feet above sea-level.

The patient was given tuberculin O.T. by mouth, commencing February 18th with 0.0001 mg., which was increased to 0.0002 mg. on May 13th. The patient lost one pound and a quarter in three months, and her condition remained stationary. The leukocytic counts were as follows:

	February 6, 1911.		March 6, 1911.		May 17, 1911.	
Polynuclear neutrophiles	80%		61%		67%	
" " with 1 nucleus	12%	75%	10%	68%	11%	75%
" " " 2 nuclei	63%		58%		64%	
" " " 3 "	22%		32%		25%	
" " " 4 "	3%	25%	0%	32%	0%	25%
" " " 5 "	0%		0%		0%	
Lymphocytes	15%		32%		33%	
Mononuclear cells	2%		5%		0%	
Transitional "	1%		0%		0%	
Eosinophile "	2%		2%		0%	

Case IV.—L. G., aged twenty-six years, female, Stage II, Class II, stationary, capable, non-toxic, a patient of one of us at the Home for Consumptives, Chestnut Hill. The patient was given tuberculin O.T. by mouth, beginning on February 27th with 0.0001 mg., which dose was increased May 13th to 0.0002 mg., June 5th to 0.0003 mg., June 10th to 0.0005 mg., and June 17th to 0.001 mg., the last dose being given June 24th. The patient lost four pounds and a quarter during four months, and was not so well when treatment was stopped as she was when it was started. The blood counts were as follows:

	February 6, 1911.		March 6, 1911.		May 17, 1911.		July 17, 1911.	
Polynuclear neutrophiles	76%		70%		78%		58%	
Polynuclear neutrophiles with 1 nucleus	19%	78%	7%	68%	11%	72%	3%	77%
Polynuclear neutrophiles with 2 nuclei	59%		61%		61%		74%	
Polynuclear neutrophiles with 3 nuclei	22%	22%	31%	32%	28%	28%	23%	23%
Polynuclear neutrophiles with 4 nuclei	0%		1%		0%		0%	
Polynuclear neutrophiles with 5 nuclei	0%		0%		0%		0%	
Lymphocytes	24%		30%		22%		33%	
Mononuclear cells	0%		0%		0%		8%	
Transitional "	0%		0%		0%		1%	
Eosinophile "	0%		0%		0%		0%	

PATIENTS AT HOME FOR CONSUMPTIVES, CHESTNUT HILL, PA.

Case III, G. N., Stage III, Class III, Stationary.

Given Tuberculin O.T. by mouth same dose for three months, then increased.

Lost 1¼ lbs. in three months. General condition about the same.

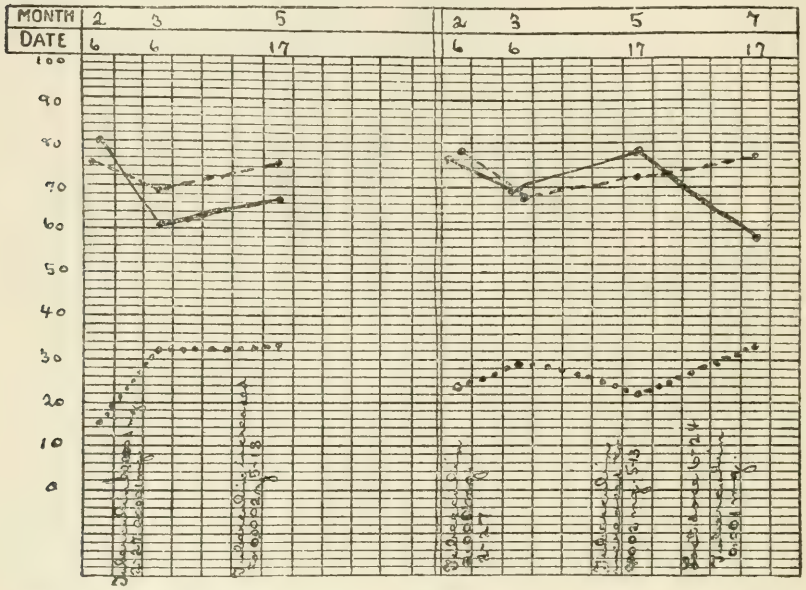
———=Polynuclears. . . . =Lymphocytes.

Case IV, L. G., Stage II, Class II, Stationary.

Given tuberculin O.T. by mouth same dose for three months, then increased.

Lost 5¼ lbs. in five months. General condition slightly worse.

— — — —=Classes I and II of Arneth.



Case V.—T. M., aged five years, female, Stage II, Class I, stationary, capable, non-toxic, a patient of one of us at the Philadelphia Jewish Sanatorium for Consumptives at Eagleville, Pa., situated about 600 feet above sea-level. The patient was given tuberculin bouillon filtrate by mouth, commencing May 8th with a dose of 0.00002 mg., each subsequent dose being increased by 0.00002 mg., and later by 0.00005 mg. The patient gained 5¾ pounds in three months and a half, but her condition remained about the same. The blood count follows:

	April 9, 1911.		May 7, 1911.		June 19, 1911.		July 16, 1911.	
Polynuclear neutrophiles . .	74%		71%		65%		41%	
Polynuclear neutrophiles with 1 nucleus	5%	60%	9%	65%	7%	77%	6%	78%
Polynuclear neutrophiles with 2 nuclei	55%		56%		70%		72%	
Polynuclear neutrophiles with 3 nuclei	40%	45%	35%	35%	23%	23%	22%	22%
Polynuclear neutrophiles with 4 nuclei	5%		0%		0%		0%	
Polynuclear neutrophiles with 5 nuclei	0%		0%		0%		0%	
Lymphocytes	18%		21%		35%		59%	
Mononuclear cells	6%		3%		0%		0%	
Transitional "	0%		2%		0%		0%	
Eosinophile "	2%		3%		0%		0%	

Case VI.—L. S., aged ten years, female, Stage II, Class I, stationary, capable, non-toxic, a patient of one of us at the Eagleville sanatorium. The patient was given tuberculin "old" by mouth, commencing June 17th with 0.000025 mg., each subsequent dose being increased at first by 0.000025 mg., and later by 0.00005 mg. The patient gained three-quarters of a pound in one month, her condition remaining stationary. Three counts were made before treatment was begun and one a month later.

	April 9, 1911.		May 7, 1911.		June 18, 1911.		July 16, 1911.	
Polynuclear neutrophiles . .	75%		68%		71%		57%	
Polynuclear neutrophiles with 1 nucleus	4%	54%	8%	69%	2%	75%	11%	75%
Polynuclear neutrophiles with 2 nuclei	50%		61%		64%		64%	
Polynuclear neutrophiles with 3 nuclei	43%	46%	31%	31%	36%	36%	25%	25%
Polynuclear neutrophiles with 4 nuclei	3%		0%		0%		0%	
Polynuclear neutrophiles with 5 nuclei	0%		0%		29%		0%	
Lymphocytes	20%		24%		0%		40%	
Mononuclear cells	4%		6%		0%		3%	
Transitional "	0%		0%		0%		0%	
Eosinophile "	1%		2%		0%		0%	

PATIENTS AT PHILADELPHIA JEWISH SANATORIUM FOR CONSUMPTIVES, EAGLEVILLE, PA.

Case V, T. M., Stage II, Class I, Stationary.

Given tuberculin bouillon filtrate by mouth in ascending doses.

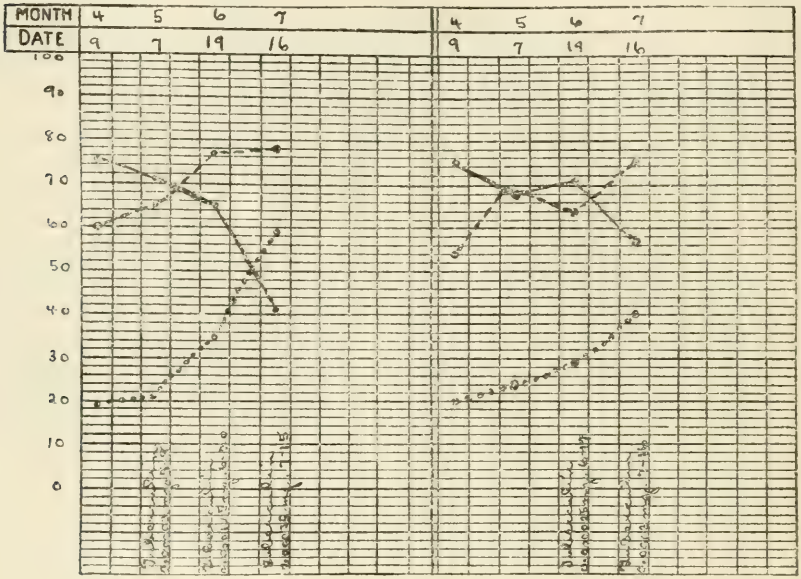
Gained 6 lbs. in three months. General condition remained about the same.

Case VI, L. S., Stage II, Class I, Stationary.

Given tuberculin "old" by mouth in ascending doses.

Gained ¾ lb. in one month. General condition remained about the same.

———=Polymorphonuclears . . . .=Lymphocytes — — — —=Arneth I and II.



PROGNOSIS IN PULMONARY TUBERCULOSIS

By H. S. Mathewson, M.D.
Fort Stanton, N. M.

(Read by title)

Since March, 1907, in reporting the physical findings to the transferring officer in cases of pulmonary tuberculosis admitted to the United States Marine-Hospital Sanatorium at Fort Stanton, New Mexico, an attempt has been made at prognosis, in order that an idea might be conveyed of the class of cases considered favorable for transfer to the arid southwest. Under many conditions prognosis becomes of considerable importance, especially when the question of change of residence is involved, and it is thought that a review of 500 consecutive admissions, with their accompanying prognoses, may be of value. The last cases of this series were admitted in the spring of 1910. All save one were adult males between the ages of eighteen and sixty-five.

All patients admitted at Fort Stanton are examined and charted within a week after arrival. The prognosis is expressed in the following terms:

"Favorable"—in which case a cure, apparent cure, or arrest is expected, with ability to work maintained.

"Favorable for prolongation of life"—in which case survival beyond a three months' period or indefinitely, or even an arrest, may be expected, but all cases of this class remain partially or completely disabled.

"Unfavorable"—in which case death occurs usually within three months.

The 500 admissions were classed as follows:

Favorable, 293; favorable for prolongation of life, 131; unfavorable, 76.

In these 500 admissions the prognoses have been verified by the subsequent course of the disease in 412 cases, or 82.4 per cent., leaving 88 cases, or 17.6 per cent., to be accounted for.

Of the 293 "favorable" cases, there were 61 in which the prognosis should have been less optimistic. Twenty of these died of causes which could not have been foreseen at the time of making the prognosis, as follows:

In 6 cases hemorrhage caused marked changes, followed at various inter-

vals by death. In 4 cases hemorrhage produced sudden death. Two cases died of tuberculous meningitis; 2 of tuberculous pericarditis; 1 of pneumothorax; 1 of pyothorax; 1 of tuberculous laryngitis; 1 of cancer of the stomach; 1 of nephritic coma; and 1 of chronic alcoholism.

Of the 41 remaining cases, 17 are dead of extension of their disease, 12 were discharged "not improved," and 10 cases remain under treatment, in none of whom can a favorable result be expected.

Of the 131 cases in which the diagnosis of "favorable for prolongation of life" was made, 11 cases have been discharged, with a result better than the prognosis anticipated. Three of these were apparently cured, and 8 were discharged with the disease arrested. Of the remaining 120 cases, 64 are dead, having survived anywhere from three months to three years after admission; 30 have been discharged "not improved," and 26 still remain under treatment, in but 5 of whom a result better than the prognosis is to be expected.

A prognosis of "favorable for prolongation of life" does not mean much, but should be made in all cases in which, even if an apparent cure or arrest is secured, the patient is left so badly damaged as to be unable to work.

Of the 76 cases in which prognosis was "unfavorable," 61 are dead, leaving 16 cases, or practically 20 per cent., in which a better result than was expected has been secured. Of these 15 cases, 2 were discharged apparently cured, in 1 of whom the diagnosis should have been abscess of the lung following operation on lower jaw rather than tuberculosis of lung. In the other case asthma and bronchitis, chronic, were present, with little tuberculous involvement of the lung. Three cases were discharged arrested, in 2 of whom tuberculous laryngitis cleared up; in the other, a simple diffuse nephritis. Five cases were discharged improved, areas of recent involvement having cleared up under treatment. One case was discharged not improved after fifteen months' observation. Four cases remain under treatment, in but one of whom is a good result to be expected.

In reviewing the 88 cases in which the result of treatment was worse or better than anticipated in the prognosis, to discover the causes of error, it appears that favorable cases may become unfavorable on account of hemorrhage or extension of the disease to other organs of the body or by a sudden breaking-down of a hitherto maintained immunity to the toxins of the disease. These sources of error appear to be unavoidable. Another source of error is the so-called silent chest, *i. e.*, some cases appear to have serious involvement without definite physical signs, and we have come to view with suspicion cases presenting considerable areas of silence, or areas of weak and

inconstant respiratory sounds. In the cases where a better result of treatment than was anticipated was obtained, ideal climatic conditions, joined with an unusual resistance to the disease, seem to combine to be the factor responsible for the result, though a possible source of error in these cases lies in mistaking for serious involvement of lung tissue areas of bronchitis or transitory edema or pleural sounds.

As to prognosis in regard to transfer to high altitudes in the southwest, a few conclusions, drawn from our experience at Fort Stanton, where the altitude is 6281 feet, may be of interest.

During the early years of the operation of the sanatorium instructions were issued the various marine hospitals to request transfer to Fort Stanton of all cases of tuberculosis who were able to travel. This resulted in the transfer of many hopeless cases. Consequently, instructions were issued in the summer of 1909 to treat at the home stations the following classes of cases:

1. Patients whose pulse remains above 100 and temperature remains above normal after treatment in hospital.

2. Cases of tuberculosis complicated by asthma.

3. Cases of tuberculosis complicated by uncompensated valvular disease of the heart.

4. Tuberculosis complicated by chronic alcoholism.

5. Chronic fibroid cases.

As to Class 1, some difference of opinion may arise, but 75 per cent. of such cases admitted to Fort Stanton result either in death or in discharge to return home to die. The remaining 25 per cent., arriving with a high temperature, would doubtless, under treatment at the home station, have become afebrile and fit for subsequent transfer, thus avoiding the dangers of a long journey in a febrile and toxic state. Without doubt certain classes of cases of tuberculosis do wonderfully well in the arid southwest, but only suitable cases should be advised to proceed there, and the wide-spread belief that a change of climate has miraculous possibilities should be discouraged.

REPORT OF 34 CASES OF TUBERCULOSIS TREATED WITH TUBERCULINS AND 18 WITH MERCURY AT THE MARINE-HOSPITAL SANATORIUM, FORT STANTON, N. M.

By L. D. Fricks, M.D., Wm. Keiller, M.D., F. Simpson, M.D., and F. C. Smith, M.D.

Fort Stanton, N. M.

(Read by title)

The cases reported here are few, but of more than passing interest because of prolonged observation before and after treatment under constant climatic and hygienic conditions. The nomenclature adopted by the National Association is employed.

SERIES A

This series includes 24 cases treated December, 1908, to July, 1909, with tuberculin B. F. The method of Denys was followed throughout, and every effort made to avoid marked reactions. Fresh dilutions were made daily from stock kept on ice in the dark.

Selection of Cases.—Choice was made from 254 patients, and those selected who had either reached their probable maximum degree of improvement or those with very slowly progressing disease, but still showing good resistance All cases except the two with surgical tuberculosis were of favorable prognosis considering the immediate aspect, but in none was the course entirely satisfactory. All were afebrile except two, who had occasional slight elevation. All cases which persisted in treatment two months or more are included here. This represents, then, our best results, because those unable to tolerate minute doses, *i. e.*, febrile cases, were thus eliminated.

The average stay before tuberculin was begun was fourteen months; average stay after this treatment was completed, thirteen months; average duration of treatment, one hundred and fifty-one days. The initial dose in each instance was 0.00001 mgm., except the cases of bone tuberculosis, where the first doses were 0.0001 mgm. and 0.0005 mgm. respectively.

A two-hour temperature chart was kept, rest enforced, all symptoms closely observed, and physical examinations were made bimonthly.

RESULTS.—Seven cases slowly progressing continued to progress; 5 stationary cases remained unchanged; 2 improving cases continued to improve; 8 others improving and 2 others stationary had probably made their maximum improvement, and the course of the disease was not altered by treatment, although an apparently unfavorable result was observed. In the pulmonary cases bacilli disappeared from the sputum before tuberculin treatment in 1 case, and reappeared after; disappeared during treatment in 3 cases, reappearing later in 1 of these; disappeared after treatment twice.

To this series may properly be added another case, W. S., moderately advanced, under observation here forty-one months; improved the first year, then stationary. He then absented himself for six months, under distinguished advice, in an excellent sanatorium, receiving Spengler's tuberculins T. B. V. (human) alternated with P. V. (bovine), and followed by J. K. (?)—39 injections in all, with maximum doses of 0.01, 0.001 mgm. of the first two tuberculins respectively. He then returned to Fort Stanton with disease progressing, developed a tuberculous epididymitis which was excised, and a pleural effusion which was aspirated. After further observation of fourteen months he was discharged as again arrested. Bacilli were constantly present.

SERIES B

This includes 10 cases treated December, 1908, to March, 1909, with a proprietary tuberculin,—"Tuberculin Purum,"—manufactured by the Tuberculin Society of St. Petersburg, Russia, and courteously furnished gratis to us by Morgenstern & Company, of New York, for trial. Some rather unusual claims for this tuberculin are made, among others that it is purified of certain principles which give rise to toxic reactions.

In accordance with Gabrilowitch's scheme of dosage with this tuberculin (Transactions Sixth International Congress on Tuberculosis) the initial injection was 0.002 mgm., the increase rapid, and the injections made twice a week, in the absence of contraindications. As will be noted, a dosage of 100 mgm. was attained in less than two months in some cases, which would either substantiate the claim that it was purified or else raise a suspicion that it was not very potent. The fact that in three cases of this series severe reactions caused its discontinuance, and the frequency with which toxic symptoms were encountered, would incline one to think that it still possessed the usual properties.

The same rule was followed in selecting cases as were observed in Series A, and the same regimen of observation. The periods of observation before and after treatment averaged somewhat longer. Bacilli were constantly present in all the cases of this series.

We encountered more reactions than with the bouillon filtrate. The duration of treatment is shorter, in accordance with current opinion as to its use. Results did not seem to justify a repetition of the course, and the only conclusion possible seems to be that this tuberculin is no different from others commonly employed, except that larger doses, according to the vendor's estimate, could be used without producing reactions. The great necessity for the standardization of tuberculins and plans for work on the subject at the Hygienic Laboratory in the ensuing year are mentioned in the Surgeon General's (Public Health and Marine Hospital Service) last annual report.

SERIES C

This includes 18 cases treated June and July, 1908, with deep muscular (gluteal) injections of mercuric succinimid, according to the dosage of Surgeon B. L. Wright, U.S.N., with adequate antiseptic technic. As will be recalled, certain parasitotropic and antitoxic properties are claimed for mercury when administered in this way, and some of the cases selected were such as could expect to receive no benefit except from an agent of extraordinary virtue. Effort was made to include as many as possible with a reasonable chance to improve, but as the pain caused by the injection is often severe, few but those extremely dissatisfied with their condition volunteered for this treatment. Those with a history of syphilis were excluded, except one case, M.C. Bacilli were constantly present in all cases except one, F.M., in whom they were never found.

Results.—No change in the course of the disease during treatment was observed, except in one instance, where a slowly progressing, occasionally febrile case became stationary and afebrile, remaining so after treatment.

None of these patients was improving when the administration of mercury was begun. Of 6 stationary cases, 2 began to improve after the course was finished, and in 2 the disease advanced after the course was complete, but both the latter were occasionally febrile before and during treatment, and may have been advancing undetected. In the 2 remaining stationary cases and the 11 remaining progressive cases the subsequent course of the disease continued the same. Of the 5 febrile cases, all continued febrile; of the 7 cases occasionally febrile, 1, as already mentioned, became afebrile, the temperature of the other 6 continuing to show the same irregular elevation.

SERIES A

Treated with Bouillon Filtrate (Denys)

	Stage on Admission.	Time Present before Tuberculin was Begun.	Course of Disease before Tuberculin was Given.	Duration of Tuberculin Treatment.	Number of Injections, Maximum Dose.	Course of Disease During Treatment.	Observed since Tuberculin Treatment.	Course of Disease since Tuberculin Treatment.	Final Result.	Remarks.
		Months.		Mo.–Da.	Mgm.		Months.			
L. S.	Incip.	30	Improved for six months then slowly progressing afebrile; losing weight.	7–3	44 0.7	Slowly progressed; afebrile; lost 7 pounds.	18	Slowly progressed.	Unimproved.	
E. H.	Incip.	21½	Stationary; afebrile; gained 10 pounds.	4–23	42 0.4	Stationary; afebrile; gained 1½ pounds.	2	Stationary.	Arrested.	Bacilli disappeared during treatment.
P. P.	Mod. adv.	22	Improved one year; then slowly progressed; afebrile; lost 1 pound.	5–18	45 0.6	Slowly progressed; afebrile; lost 16 pounds.	18	Slowly progressed until few months before discharge.	Arrested.	
P. B.	Mod. adv.	21	Stationary one year, then slowly progressing; gained 10 pounds; lost 10pounds;afebrile.	2–4	19 0.001	Progressed, frequent rise in temp. —37.4°–38.4°C.; gained 4 pounds.	26	Slowly progressed; occasionally febrile; lost 11 pounds.	Unimproved.	Discontinued because not tolerated.
S. I.	Mod. adv.	6	Improving; afebrile.	6–0	46 0.8	Stationary; afebrile.	19	Stationary; afebrile.	Arrested.	
R. M.	Mod. adv.	17	Stationary first six months; then improved; afebrile.	2–11	23 0.005	Stationary; afebrile.	9	Stationary; afebrile.	Apparently cured.	Bacilli disappeared after treatment.
T. E.	Mod. adv.	12½	Improving; afebrile; gained 14 pounds.	4–16	37 0.09	Stationary; afebrile; lost 7 pounds.	10	Stationary; afebrile.	Arrested.	Bacilli disappeared before treatment, reappeared after.
D. D.	Mod. adv.	13	Stationary first four months, then improved; afebrile.	3–29	37 0.07	Stationary, afebrile; sputa frequently blood-streaked; lost 5 pounds.	10	Stationary; afebrile.	Improved.	

SERIES A—(*Continued*)

	Stage on Admission.	Time Present before Tuberculin was Begun.	Course of Disease before Tuberculin was Given.	Duration of Tuberculin Treatment.	Number of Injections, Maximum Dose.	Course of Disease During Treatment.	Observed since Tuberculin Treatment.	Course of Disease since Tuberculin Treatment.	Final Result.	Remarks.
		Months.		Mo.–Da.	Mgm.		Months.			
R. B.	Mod. adv.	5	Improving; occasional temp. 37.3° C; gained 19 pounds.	4–26	42 0.4	Stationary; frequent rise in temp.—37.6° C.; slight gain, then slight loss in weight.	12	Stationary; temp.—37.4° C., occasionally until few months before discharge; lost 9 pounds.	Apparently cured.	Bacilli disappeared during treatment, reappeared afterward and again disappeared.
J. A.	Mod. adv.	6	Improving; afebrile; gained 5 pounds.	4–9	36 0.07	Stationary; afebrile 3 months, then continuous fever—38.° C—for three weeks.	10½	Stationary; afebrile; lost 6 pounds.	Apparently cured.	Bacilli disappeared after treatment.
F. B.	Mod. adv.	12½	Improved two months; gained 10 pounds; then slowly progressing, occasionally febrile; lost 18 pounds.	12–14	14 0.0005	Progressed; fever to 38° C. and 40° C.; gained 6 pounds.	22	Progressed; irregular fever.	Death.	Discontinued because not tolerated.
P. G.	Far adv.	20	Improving; afebrile; gained 22 pounds.	2–9	18 0.0009	Progressed; occasional temp., 37.6° C., continuous fever, 38.8° C. after maximum dose; exacerbation symptoms.	26½	Stationary; afebrile.	Arrested.	Discontinued because not tolerated.
A. B.	Far adv.	2	Stationary; afebrile; gained 7 pounds.	5–25	43 0.5	Stationary; occasional temp., 37.8° C. first three months, then afebrile; general condition improved; lost 4 pounds.	12	Stationary; afebrile.	Improved.	

N. A	Far adv.	68	Stationary; fibroid; afebrile.	7–9	52 6.6	Stationary; frequent temp., 37.4° C.	10	Stationary; afebrile.	Death.	Died of intercurrent disease.
W. L.	Far adv.	1½	Improving; afebrile; gained 3 pounds.	3–23	31 0.01	Stationary; afebrile; lost 1½ pounds.	24	Stationary; afebrile.	Arrested.	
K. T.	Far adv.	12½	Stationary; afebrile; lost 3 pounds.	3–22	29 0.009	Stationary; afebrile; lost 5 pounds.	6½	Stationary; afebrile.	Arrested.	
G. B.	Far adv.	11	Improving; afebrile; gained 40 pounds, then lost 9½ pounds.	7–26	56 7.0	Improved; frequent temp., 37.4° C.; gained 4 pounds.	20½	Improved; afebrile.	Arrested.	
T. C.	Far adv.	16	Stationary; afebrile; gained 15 pounds.	5–29	51 3.0	Stationary; occasional temp., 37.5° C.; gained 3 pounds.	1	Stationary; afebrile.	Arrested.	
J. C.	Far adv.	7	Improved first six months; then stationary; afebrile; gained 9 pounds.	5–29	42 0.6	Stationary; afebrile; lost 5 pounds.	10	Stationary; afebrile.	Arrested.	Symptoms of tuberculosis ninth thoracic vertebra cleared up during tuberculin treatment with absolute rest three months on special bed.
M. H.	Far adv.	18½	Improving; afebrile; gained 32 pounds.	7–9	59 9.0	Improved; afebrile; gained 2 pounds.	1	Improved; afebrile.	Arrested.	
D. P.	Far adv.	9	Stationary; afebrile; gained 2 pounds.	8–10	55 8.0	Stationary; afebrile; lost 8 pounds.	11½	Slowly progressed; lost 16 pounds.	Death.	Died suddenly of hemorrhage.
H. H.	Far adv.	3½	Improving; afebrile; gained 6 pounds, then lost 1 pound.	5–22	41 0.3	Stationary; afebrile; lost 3 pounds.	6½	Stationary; afebrile.	Arrested.	Bacilli disappeared during treatment.
O. I.	Open tuberculosis of spine.	1½	Progressing; afebrile.	4–15	18 3.0	Progressed; occasional temp., 38.5° C.; lost 6 pounds.	13	Progressed; febrile.	Death.	Discontinued because not tolerated.
W. B.	Open tuberculosis of pelvis.	2½	Stationary; afebrile; gained 17 pounds.	4–6	19 20.0	Progressed; frequent temp., 37.6° C.; lost 5½ pounds.	10	Progressed; febrile.	Death.	Discontinued because not tolerated.

SERIES B

Treated with Tuberculinum Purum

	Stage on Admission.	Present before Treatment.	Course of Disease Previous to Tuberculin Treatment.	Duration of Tuberculin Treatment.	Number of Injections, Maximum Dose.	Course of Disease During Treatment.	Observed since Treatment.	Course of Disease since Treatment.	Result on Discharge.	Remarks.
		Months.		Mo.–Da.	Mgm.		Months.			
F. T.	Mod. adv.	57	Slowly progressing; occasionally febrile.	1–13	12 10	Stationary; chill and high fever at 2 mgm; continued 40° C. four days.	2¼	Stationary.	Death.	Discontinued, not tolerated; died suddenly of intercurrent disease. Took mercury six monthspreviously.
W. S.	Mod. adv.	4½	Improving; afebrile; gained 11 pounds.	1–24	15 80	Stationary; physical signs worse; gained 3 pounds; occasional temp., 37.4° C.	6	Stationary; lost 12 pounds.	Arrested.	
T. M.	Far adv.	12½	Stationary; occasionally febrile; gained 6 pounds, then lost 12 pounds.	1–24	20 100	Stationary; occasionally febrile.	9½	Stationary.	Unimproved.	
J. L.	Far adv.	20	Stationary; afebrile.	2–4	20 100	Stationary; severe reactionat 2 mgm.; lost 2 pounds.	18	Progressed.	Death.	
J. F.	Far adv.	15	Progressing; febrile.	2–0	12 10	Progressed; febrile.	7½	Progressed; febrile.	Death.	
W. W. M.	Far adv.	60	Improving; afebrile.	2–17	20 100	Improved; occasional slight reaction.	24	Improved; afebrile.	Arrested.	
O. B.	Far adv.	52	Stationary; afebrile.	1–27	20 100	Stationary; occasional slight reaction; lost 4 pounds.	24	Stationary; afebrile.	Arrested.	
E. E.	Far adv.	18	Slowly progressing; occasionally febrile.	2–21	14 1.00	Progressed; frequent severe reaction.	18	Progressed; febrile.	Death.	Discontinued; not tolerated.
H. P.	Far adv.	6½	Slowly improving; occasionally febrile.	2–0	20 100	Improved; frequent temp. 38° C. after large doses.	24	Slowly improved.	Arrested.	
W. M.	Far adv.	41	Stationary; occasionally febrile.	2–17	14 4	Stationary; frequent reactions.	24	Stationary; afebrile.	Arrested.	Discontinued; not tolerated.

SERIES C

Treated with Deep Muscular Injections of Mercuric Succinimid

	Stage on Admission.	Present before Mercury Treatment.	Course of Disease Previous to Mercury Treatment.	Duration of Mercury Treatment.	Number of Injections, 1/6 Grain	Number of Injections, 2/6 Grain.	Course of Disease During Treatment.	Observed since Treatment.	Course of Disease since Treatment.	Result on Discharge.	Remarks.
		Months.		Mo.–Da.				Months.			
F. T.	Mod. adv.	51	Slowly progressing; occasionally febrile.	1–26	14	6	Stationary; afebrile.	8½	Stationary; afebrile; gained 5½ pounds.	Death.	Died of intercurrent disease.
H. S.	Mod. adv.	3	Stationary; afebrile; lost 1 pound.	0–20	5	0	Stationary; afebrile.	5	Stationary; afebrile.	Arrested.	Discontinued by patient; pain. Took mercury by mouth 1 month longer.
E. M.	Mod. adv.	12	Progressing; occasionally febrile; lost 30 pounds.	1–13	14	1	Progressed; occasionally febrile; lost 5 pounds.	5	Progressed; febrile.	Death.	
B. M.	Mod. adv.	15	Progressing; febrile.	1–20	14	4	Progressed; febrile.	12	Progressed; febrile.	Death.	
F. M.	Mod. adv.	18	Stationary; afebrile; lost 14 pounds.	1–26	14	0	Stationary; afebrile.	12	Stationary; afebrile.	Unimproved.	Salivation prevented further treatment.
H. M.	Mod. adv.	20	Progressing, febrile; tuberculosis of larynx.	1–14	11	0	Progressed; febrile.	5	Progressed; febrile.	Death.	Salivation prevented further treatment.
O. O.	Mod. adv.	7	Stationary; afebrile; gained 4½ pounds, then lost 7½ pounds.	1–26	15	8	Stationary; afebrile.	7	Improved; afebrile; gained 2½ pounds.	Arrested.	
H. B.	Far adv.	13	Progressing; occasionally febrile; lost 11 pounds.	1–26	6	0	Progressed; occasionally febrile.	4	Progressed; febrile.	Death.	Salivation prevented further treatment.
A. R.	Far adv.	29	Progressing; febrile; lost 15 pounds.	0–25	13	0	Progressed; febrile; gained 1 pound.	8	Progressed; febrile.	Death.	Severe salivation and necrosis of jaw.

SERIES C.—(*Continued.*)

	Stage on Admission.	Present before Mercury Treatment.	Course of Disease Previous to Mercury Treatment.	Duration of Mercury Treatment.	Number of Injections, $\frac{1}{5}$ Grain	Number of Injections, $\frac{2}{5}$ Grain.	Course of Disease During Treatment.	Observed since Treatment.	Course of Disease since Treatment.	Result on Discharge.	Remarks.
		Months.		Mo.-Da.				Months.			
M. M.	Far adv.	21	Progressing; febrile; lost 13 pounds.	0-25	14	0	Progressed; febrile; lost 3 pounds.	9	Progressed; febrile.	Death.	Discontinued by patient.
L. M.	Far adv.	17	Progressing; afebrile; lost 18 pounds.	1-26	15	7	Progressed; afebrile; gained 3 pounds.	4	Progressed; afebrile.	Death.	
M. C.	Far adv.	½	Progressing; febrile.	1-10	15	2	Progressed; febrile.	½	Progressed; febrile.	Death.	
G. G.	Far adv.	8	Slowly progressing; afebrile; lost 20 pounds.	1-26	14	7	Slowly progressed; afebrile; lost ½ pound.	7	Progressed 2 months; then improved; gained 11 pounds.	Improved.	
C. H.	Far adv.	6	Stationary; occasionally febrile; gained 8 pounds.	1-26	15	7	Stationary; occasionally febrile; lost 6 pounds.	5	Progressed; occasionally febrile.	Death.	
J. M.	Far adv.	13	Slowly progressing; occasionally febrile; lost 11 pounds.	0-8	4	0	Progressed; febrile.	2	Progressed; febrile.	Death.	Discontinued by patient; pain. Took mercury by mouth a few weeks longer.
T. M.	Far adv.	6	Progressing; occasionally febrile; lost 4 pounds.	1-26	14	4	Progressed; occasionally febrile; lost 4 pounds.	11	Progressed; febrile.	Death.	
P. C.	Far adv.	6	Stationary; occasionally febrile; lost 7 pounds.	1-26	15	3	Stationary; occasionally febrile; gained ½ pound.	34	Slowly progressed; occasionally febrile; lost 14 pounds.	Unimproved.	
J. H.	Far adv.	5	Stationary; afebrile; lost 13 pounds.	0-11	4	0	Stationary; afebrile.	23	Improved; afebrile; gained 18 pounds.	Apparently cured.	Discontinued by patient; took mercury by mouth few weeks. Tuberculous knee-joint excised four months after mercuric treatment.

Noting results in relation to the amount of mercury given, there were 3 of the 5 ultimately good results among the 10 receiving 17 or more injections; the other 2 cases with good results received 5 and 4 injections respectively. The case dying of intercurrent disease was arrested, and is classed as a good result.

CONCLUSIONS

1. We were unable to detect any effect of bouillon filtrate on the general course of the disease.

2. Tuberculinum purum produced the usual toxic phenomena when proper dosage was exceeded, and otherwise effected no change in the general course of the disease.

3. We found no evidence that mercury has any specific action in pulmonary tuberculosis.

PATHOLOGICAL SECTION

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INVESTIGATIONS INTO THE NATURE OF TUBERCULIN SENSITIVENESS

By Edward R. Baldwin, M.D.
Saranac Lake

For more than twenty years much speculation has been made about the nature of the inflammatory reaction produced by tuberculin, and first described by Koch when he introduced that substance. It has formed the subject of many theories and experiments which did little to enlighten us, and, it is only fair to add, to impress the medical world at large with the importance of the problem.

By tuberculin sensitiveness we mean a local inflammatory process in and around foci of tuberculosis, as well as in the skin or mucous membranes, due to the injection or local application of tuberculin. Fever and general symptoms may or may not accompany the reaction. By tuberculin we mean any extract or preparation of tubercle bacilli except the pure fat or wax extractions, which have no reacting power when separated from the protein constituents in a pure state.

The importance of a thorough understanding of the pathological physiology of the tubercle as a unit cannot be overestimated. Pathology has clearly shown us the effects of the implantation of tubercle bacilli in the tissues, but physiological research is needed to reveal the nature of the process of tubercle formation and its reactions.

It is unprofitable to review the theories bearing on the tuberculin reaction except in the briefest way.

Koch and others accounted for it by assuming that tuberculin injections simply added to that already present in the tubercles, thus increasing the inflammation, the real cause of which was unexplained. Later, the idea of a ferment produced in the tubercle by the presence of the bacillus and its products, and, acting on them, was thought to cause the sensitive reaction. This was more in line with later discoveries in bacteriology, especially the bacteriolytic phenomena whereby bacteria were found to be broken up and a toxic effect produced in animals previously injected with similar bacteria.

More recently the knowledge that all forms of protein substances, when introduced into the body outside of the digestive tract, are able to produce a specific sensitiveness, gave an explanation for the tuberculin phenomena.

Certain peculiarities in the tuberculin sensitiveness have not been fully accounted for; of these I shall speak later. The main cause of the reaction may be regarded as settled at present as due to the presence in the body of a foreign protein—the protein of tubercle bacillus; just as in serum disease the fever, urticaria, and joint swellings are due to sensitiveness acquired from a previous injection of the foreign serum-protein. In both instances a protein foreign to the body is digested, assimilated, or disposed of by tissues outside of the usual digestive tract. A changed condition in relation to the special protein, whether it be of bacterial origin or from some other animal, is thus stamped upon that individual, called by von Pirquet "allergy," meaning altered reaction. The term "anaphylaxis" is also used to express the same thing, but erroneously, because it was originally applied to a special toxic reaction in sensitized individuals, and in my opinion should be restricted to this.

The phenomena of tuberculin sensitiveness have acquired more and more interest as studies on immunity have developed, and since the revival of tuberculin treatment; which continues an empirical method despite efforts to discover some accurate guide for its administration and selection of suitable patients. It has long been our belief that in a complete knowledge of the formation, reactions, and fibrous transformation of the individual tubercle we should arrive at the best rationale in therapy for tuberculosis. To that end there have been experiments made at the Saranac Laboratory—for the most part, of a preliminary character—during the past fifteen years. At first the questions were largely concerned with the value of the diagnostic tuberculin test: Whether or not a reaction could occur in the absence of tuberculous lesions in the animal; how soon after infection could the reaction develop; whether it was specific or not, and, finally, whether or not it could spread the disease. Most of these questions were answered satisfactorily so far as the laboratory animals could be used as criteria. It can be said broadly that no reaction could be elicited in animals freed from tubercles by operation, nor in animals into which porous capsules containing tubercle bacilli had been placed.

I am aware that similar experiments in calves have resulted positively (Heymanns), yet the question arises whether or not bacilli escaped from the capsules in these animals. Moreover, animals subjected to injections of powdered insoluble substances like glass and charcoal, which become en-

cysted in tubercle-like nodules, cause no tuberculin sensitiveness. In diseased animals it was found that six to eight days after inoculation reactivity was developed, gradually increasing to full strength in fifteen to twenty days. It, therefore, corresponded to the incubation period of infectious diseases in general.

Later work by von Pirquet and others showed a similar result in vaccinia after primary vaccination, a fact previously well known, but not brought into comparison with other immunity phenomena. During the past four years very many workers have busied themselves with the study of anaphylactic sensitization, and much valuable knowledge has been obtained. It has been said that the tuberculin reaction is a special form of anaphylaxis, or, to use a better term, of tuberculo-protein sensitiveness. We have been able, with filtered water extracts of the tubercle bacillus free from bacilli, actively to sensitize non-tuberculous guinea-pigs and rabbits. Not only do such pure protein products of the bacillus sensitize, but a boiled glycerin extract will do the same thing. This sensitiveness is not, however, revealed by any local and fever reaction, as in the tuberculous animal, or by a fatal but gradual collapse from an overdose, but by a typical anaphylactic death after intravenous or intracerebral injections of the above-mentioned extracts.

By the simple subcutaneous injection of minute quantities of tuberculoprotein into healthy guinea-pigs this form of tuberculin sensitiveness can be established, or it can be shown also in a certain proportion of tuberculous guinea-pigs which have received nothing but the infecting bacilli. Obviously, the latter have, in addition, the power to react locally and with fever, which the former do not seem to possess. Another point of difference seems to be in the maternal transmission of this anaphylactic reactivity to the offspring, which readily occurs, whereas tuberculous animals fail to transmit a local or fever reactivity to their young, so far as has been observed, a fact equally true of human infants born of tuberculous mothers. These differences formed the reason for some experiments which I have done during the past year.

The most delicate tuberculin reaction to be obtained in a guinea-pig is the intracutaneous or intradermic, as contrasted with the cutaneous or von Pirquet, which is uncertain in these animals. The temperature of guinea-pigs is too variable for accurate observations. All the experiments to be described were made by the method of Roemer, using a quantity of 0.02 c.c. old tuberculin in 0.1 c.c. normal saline solution, injected into the shaven skin of the lightest colored portion of the skin. The above dose produces in

healthy guinea-pigs at most a local swelling and redness for twenty-four hours, whereas in a tuberculous pig the swelling increases and is more marked after forty-eight hours. The temperature is not uniformly elevated, and, as mentioned, is hardly worth noting as a sign of reaction.

My first experiments were a repetition of former ones with capsules of porous Berkefeld filter clay. Some were filled with living tubercle bacilli, and others with the filtered watery extract of bacilli, *i. e.*, the tuberculo-protein. They were sealed with dental cement, and, through a small peritoneal incision, were placed into the abdominal cavity of guinea-pigs. In ten animals thus prepared none gave an intracutaneous reaction after fifteen and fifty-seven days. The capsules, of course, became encysted and shut off from the peritoneal cavity after a few weeks, but it is clear that the mere presence of tubercle bacilli in the body, though accessible to the body fluids to some degree, was unable to sensitize them to a skin test. On the other hand, some were tested for anaphylactic sensitiveness and readily showed a positive reaction.

Believing that the reason for this absence of sensitization in the skin was probably because the absorption of bacillary products, especially the protein substance, was too quick from the capsules, or that it was not sufficiently prolonged, I tried a different plan. It is well known that animal charcoal readily absorbs large quantities of animal substances from a solution, and filtered bacillary extract was found to be no exception.

Pulverized and sterilized animal charcoal was saturated with this extract, and rubbed up in emulsions with normal saline solution. Various quantities of this emulsion were injected under the skin and into the peritoneum of guinea-pigs, some but once, others at different intervals. The charcoal, being insoluble, formed non-irritant nodules under the skin and omentum. It was also deposited in the lymph-spaces near the site of injection. By this experiment it was intended to cause local storehouses or depots in the tissues, from which the protein of the tubercle bacillus should slowly dissolve. This would, in a measure, simulate the conditions in the actual tubercle of a diseased animal. Nevertheless, no reactions were obtained after twenty-one, one hundred and six, one hundred and fifty-five, and two hundred and seventy-one days, indicating that there was some element still lacking to make the experiment successful. With the thought that some property in the serum of the tuberculous animal was absent, some charcoal-protein sensitized animals were injected with serum from tuberculous guinea-pigs simultaneously with, and previous to, the intradermic tests. These tests were also negative in result within twenty-four and forty-eight hours of the

serum injections. Later, the same animals were used for a further experiment, together with fresh ones.

The failure to produce reactivity by means of the protein sensitization alone, or with the various contrivances to imitate the conditions of a tubercle, led me to think that the fatty and waxy substances in the bacillus must play a part. Much attention has been given of late to the so-called lipoids of the tubercle bacillus. By means of complement fixation methods Citron and Caulfeild have demonstrated specific reactions with the alcohol-ether extracts of tubercle bacilli. These are supposed to indicate the presence of antibodies in the sera of tuberculous persons against the lipoids of the tubercle bacillus. However this may be, it might be expected that these substances cannot be inert in the tubercle. Hence it was natural to try, by injecting an emulsion of benzol extract of the bacilli, together with the protein absorbed into charcoal, to obtain a skin reactivity. No success followed repeated small amounts intraperitoneally—0.1 c.c. 11 times in five pigs, or 1 c.c. once in another series of five pigs, both series tested after fifteen days. No better result followed a repetition of the injections 16 times and a second test after thirteen days. No better success was obtained with the alcohol-ether extract subcutaneously and intraperitoneally injected into pigs already treated with protein in charcoal.

In addition, some were given sterilized beeswax intraperitoneally, to create more or less insoluble collections, simulating the wax of the tubercle bacillus. An extract soluble only in hot alcohol was also tried, as well as inoculations of smegma bacillus cultures, combined with tuberculo-protein. None of these ruses succeeded, so that the problem seemed narrowed down to some factors connected with the cells forming the tubercle, which were not present in any other artificially produced nodules.

All attempts to transfer from a tuberculous to a normal animal a skin or any form of tuberculin reactivity have thus far failed when the whole blood or the serum has been taken for this purpose.*

On the other hand, injections of crushed tuberculous liver, spleen, and lung tissue have, when mixed with tuberculin, a fatal effect on normal guinea-pigs, according to Bail. Similar experiments that have been done in our laboratory have not been uniformly successful. Nevertheless, it is natural to suppose that the reacting ferment or antibody was present in or produced by the pathologically altered, or, let us say, adapted, cells compris-

* The successful experiments of this kind that have been reported by Yamanouchi, Helmholz, and Bauer are not conclusive, as shown by our own investigations, as well as those of Roemer, Novotný, and Onaka.

ing the tubercle. By making our solutions of tuberculin for the skin test in the plasma pressed out of gland, liver, and spleen, tubercles of various stages, we should expect to arouse a reaction in non-tuberculous but protein-sensitive pigs. I regret to say that my efforts thus far have not been successful, though it may have been because the plasma is so rapidly altered after the death of the tuberculous animal that we cannot reproduce conditions present in living tuberculous tissues.

The details of these attempts are unnecessary to mention, except that tubercles of recent and old chronic lesions were used for the material, both in a quiescent state and during the height of tuberculin reactions. There were also normal liver extracts tried as a control. Extracts of the skin of a tuberculous pig also failed, as did attempts to create skin reactivity by repeated subcutaneous injections of protein with tuberculous gland and liver plasma preserved in chloroform. These were given separately on opposite sides of the body.

In none of these tests were reactions obtained which were greater than the irritation produced in normal animals. The reasons for failures have not been apparent to me as yet, but some suggestions may be offered.

It is to be noted that if tuberculin reactivity is present in any animal, the presence of tubercles in that animal must be predicated. The tubercles may be produced by dead, sterilized bacilli, and yet reactivity will be present, though less persistent than in an animal subject to a living infection.

This persistence and delicacy of reactivity appear to be associated with tubercles not wholly transformed into fibrous nodules, and may be due to the slow disintegration and digestion of the bacilli in the periphery of the caseated center. So far we can understand why the reaction can occur in the focus, because of changed cell functions created to meet the need at this time and place. How the distant cells in the skin can acquire these reacting functions is less easily understood. If it were due to the soluble bacillus protein alone, or with the soluble fatty acids, I should have expected some positive results in my experiments.

Hence the conclusion is warranted that in nature's method of extracting and disintegrating the bacilli some product not obtained artificially is set free in the blood, to act on distant cell-groups not connected with the tubercle or directly in contact with the bacillus. Then there are differences in the quantity, as well as quality, of the bacillary substances, though this appears to me of less importance than the rate of absorption, in view of our ability to get reactions in all stages of the disease and degrees of involvement. One is forced to regard the focus or the tubercle as the controlling influence from

which the sensitizing process starts, and further study will probably reveal its mechanism.

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CONTROL OF BOVINE TUBERCULOSIS

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I almost feel that an apology is necessary for the presentation of a paper on this subject, but if anybody is to blame for my appearance here it is the secretary, who, after I had said that I had nothing new to give to the Association, at the suggestion of President Welch asked that I would give a paper on this subject, to which I consented. I felt less hesitation in doing so because, during the past year, some very important work has been published. Also, we have been confronted by a number of legislatures on this great subject. Especially active has been the Legislature of Illinois, where a commission, headed by a lawyer, was appointed to determine the scientific accuracy of the tuberculin test and the pasteurization of milk. This commission, composed of eight laymen and two physicians, has brought in a report which declares against the necessity of the tuberculin test, but admits, as it must of necessity in face of the evidence, that tuberculosis does pass from animals to man. This report has been already used in legislation to let down the bars. It is, therefore, important to those who are interested in the preservation of public health to continue the fight for pure milk.

There are two all-sufficient reasons for the control of bovine tuberculosis. The first of these is that the disease is an economic scourge—a problem affecting the farmers of the country and the public in general. It has something to do with the cost of high living—the reason why meat is so expensive. If anybody thinks that the packer who loses a lot of hogs or cows through the governmental inspection in the slaughter-houses is the loser thereby, he is mistaken. The loss falls on the consumer and on the farmer.

However, in the short time at my disposal I shall take up only the second great reason for the control of bovine tuberculosis, namely, the preservation of public health. It is unnecessary to go into the history of the subject, since Dr. Welch has very ably reviewed, in his presidential address today, the work that has been done since Koch's paper in 1901 at the British Congress on Tuberculosis. Since that time the amount of work that has been

brought forward has been enormous, and I am glad to say for American medicine that this subject had been well studied by several American workers before Koch read his paper, and that practical proof that he was wrong in his contention had already been obtained in America. Since that time we have had the reports of the results of the British Royal Commission and of the German Imperial Commission. They studied cases according to Koch's own method, namely, the isolation of cultures and the inoculation of animals of the bovine species. Further studies, made largely in this country, have shown that the rabbit is just as good a diagnostic agent for the separation of the two types of bacilli as cattle, if the dose is properly graded.

For the benefit of the laymen who are present at this meeting let me say that Koch never said that the bovine bacillus and the human bacillus were two different germs. He said that they were two types of the same species, a fact which had been demonstrated five years before by Theobald Smith. Let me mention an illustration which I use in speaking to laymen, farmers particularly. Nobody could confuse a Jersey cow with a Holstein. They are very different in appearance, and yet both belong to the bovine race. In the same way the germ of tuberculosis from man and from cattle, while presenting certain differences in appearance, and especially in disease-producing power, belongs to the same species.

You are familiar with the work of the English and German commissions. The English Royal Commission examined 60 cases, and of that number found 14 which showed bovine infection. The German Imperial Commission examined 84 children, and of that number 21, or 25 per cent., had died of bovine infection. I do not like to criticize motives, but I think anybody who has read the reports of this commission must acknowledge that they have done all they could to support Koch. Within the last year, and since the laboratory work has shown how wrong he was in his original contention, a collective report from the clinical standpoint has been published in Germany, in which an effort is made to sustain his contention. In fact, the statement is made in this paper that it goes far to support Koch's opinion. I have always held—and I think with the best of reasons—that clinical work is absolutely valueless in determining the source of infection in any given case of tuberculosis. I do not believe that there is any man in the world who can tell bovine infection from human infection clinically. We know, of course, that bovine infection is apt to determine a certain type of tuberculous lesion, and one may be justified at times in forming something of an opinion, but in generalized tuberculosis no one can tell with any degree of certainty the source of infection.

A clear demonstration of this point has been given in the city of New York. In that city, under the leadership of Drs. Holt, Northrup, and others, it was maintained by many physicians for a long time that there was no danger to children from the milk of tuberculous cattle. I have heard this subject discussed by some of these gentlemen repeatedly, and always the danger from tuberculous cattle was considered practically negligible. Dr. Wm. H. Park, Director of the Research Laboratories of the Board of Health, has taken up the subject from a laboratory standpoint and done a masterly piece of work. His conclusions are that upward of 300 children die in the city of New York every year from bovine infection. What clearer demonstration could be given of the fallacy into which men who study only the clinical side of the question are apt to fall? It is impossible for clinical men to determine this question.

I wish to call attention to Koch's change of position, because it has misled many people, even some who profess to be experts on this subject. In 1901 Koch said practically that there was no danger to human beings from bovine tuberculosis. He put it in this way:

" . . . If such a susceptibility really exists, the infection of human beings is but a very rare occurrence. I should estimate the extent of infection by the milk and flesh of tuberculous cattle, and the butter made of this milk, is hardly greater than that of hereditary transmission, and, therefore, do not deem it advisable to take any measures against it."

This amounted practically to saying that there was no danger from bovine tuberculosis, and this interpretation was accepted all over the world.

In 1908, at Washington, Koch shifted his ground absolutely. However, in his introduction he used words which implied that he still held the opinion expressed in 1901. He said: "The results of these experiments have led me to the conclusion which I have first communicated to the British Congress on Tuberculosis in 1901." He acknowledged, in these conclusions, that "Human beings may be infected by bovine tubercle bacilli, but serious disease from this cause occurs very rarely." His third conclusion was that "Preventive measures against tuberculosis should, therefore, be directed primarily against the propagation of human tubercle bacilli."

His further contention, and practically the only one which he maintained strongly, was that bovine tubercle did not produce pulmonary consumption. This change of ground has not been recognized by many people, and it should be understood by every one. Furthermore, Koch apparently ignored the proof furnished by the German Imperial Commission, although he

was one of the 25 professors directing this work. He apparently ignored the work of the English Royal Commission and that done by private workers all over the world.

It makes very little difference whether one dies of pulmonary tuberculosis, of intestinal or glandular tuberculosis, or of tuberculous meningitis. We, of course, recognize an academic difference, and also that pulmonary tuberculosis is more dangerous as a focus of infection, as a rule, than some of these other types, but so far as the death-rate goes, the location of the lesion makes very little difference. It does not concern a bereaved father or mother to know whether a child dies from tuberculosis of the lungs or from tuberculosis of the intestinal tract. The point we must keep our eye on is the fact that the bovine tubercle bacillus does gain entrance to the human body not infrequently, and produces a fatal infection. We may acknowledge, at the present time, that this infection takes place almost entirely in childhood, and chiefly during the first five years of life. In adults only 9 cases of bovine infection have been reported out of 686 examined. However, in children from five to sixteen years of age, of 132 cases examined, 33 were bovine, and of children under five years of age, of 220 examined, 59 showed bovine infection. These figures given by Dr. Park amply corroborate the results of the commissions above referred to.

Let us analyze Dr. Park's figures a little further. In pulmonary consumption he examined 294 cases without finding the bovine type of bacillus in any.

Glands of the neck, adults, 9 cases examined, 0 per cent. bovine.
Children (5–15 years), 27 cases examined, 30 per cent. bovine.
Infants (0–5 years), 19 cases examined, 68 per cent. bovine.

In corresponding cases collected by Dr. Park from foreign literature the following results were obtained:

Pulmonary consumption, 1000 cases examined, 1 per cent. bovine.
Glands of the neck, adults, 28 examined, 3.5 per cent. bovine.
Children (5–15 years), 57 examined, 30 per cent. bovine.
Infants (0–5 years), 36 examined, 58 per cent. bovine.

GENERAL FATAL TUBERCULOSIS

Adults (Park), 4 examined, 0 per cent. bovine.
" (foreign), 60 examined, 8 per cent. bovine.
Young children, 5 examined, 20 per cent. bovine.
" " (foreign), 31 examined, 32 per cent. bovine.
Infants (Park), 78 examined, 23 per cent. bovine.
" (foreign), 173 examined, 25 per cent. bovine.

A great deal of evidence of the same sort could be brought forward, but surely we need go no further to demonstrate to the most doubting person the necessity of controlling bovine tuberculosis as a method of protecting the public health.

In regard to cases of pulmonary tuberculosis being due to the bovine bacillus, we must accept the evidence at hand. However, question has arisen as to the possibility of the bovine tubercle bacillus undergoing a change by residence in the human body, so that it would take on the characteristics of the human tubercle bacillus. Dr. Welch touched on this yesterday, and concluded that the weight of evidence was against such a change, admitting, however, that it was still an open question. I may say, before going further, that it is my belief that such transformation not only can, but does, take place. How much time is required to bring this about I am not prepared to say.

In experiments at the University of Pennsylvania by Dr. Leonard Pearson and myself we succeeded in one instance in changing a bacillus of typical human type into one which was typically bovine. I acknowledge freely that the experiment was not repeated. Further than this, every one who has done experimental work in regard to tuberculosis knows that during the long period of time required it is possible for outside infection to occur. It is also possible that an experimental animal may carry a latent tuberculosis of the bovine type. However, every precaution possible was taken in these experiments and the calves were all tested with tuberculin. After five passages through calves the culture, from being typically human, became typically bovine in every respect.

During the last year Professor Eber, of Leipsic, has published a report of a similar piece of work and come to very much the same conclusion. Nocard succeeded in changing a mammalian tubercle bacillus into one of the avian type by inclosing the culture in a collodion sack and putting it in the peritoneal cavity of a bird. The fish tubercle bacillus described by Dubard almost certainly had its origin in sputum from a consumptive thrown into the stream where the fish were kept. Möller has also changed the type of the tubercle bacillus by passage through the blind worm. It is well known that birds are usually quite resistant to the mammalian tubercle bacillus, yet, either by feeding or by inoculation, a certain number will succumb. From such a bird the disease can be carried on in series. In other words, the mammalian bacillus has become changed into one of the avian type. Römer has reported an autopsy made on a tuberculous cow in which the intestines and glands were exposed to, and eaten by, chickens. One after

another the whole flock of chickens died of avian tuberculosis. Thus, we have good evidence that the tubercle bacillus does change its type and character according to the soil in which it lives. The difference between the mammalian type of tubercle bacillus and the avian type is very much greater than that between the bovine and human.

Further than this, it is well known that the tubercle bacillus, under constant cultivation in the laboratory, may undergo a loss of virulence and a change in morphology. This is strikingly illustrated in cultures of the bovine type, which, after a certain number of generations on artificial culture-media, show changes in their staining characteristics and morphology. We have certain observations also of a marked change in virulence, not only in bovine tubercle bacilli, but in human as well. If the tubercle bacillus does not change its type by prolonged residence in a given soil, it seems to be an exception to all germs of which we have any knowledge. After a number of years of work with cultures of the tubercle bacillus I acknowledge very freely that it is exceedingly retentive of its type and characteristics—perhaps more so than any other germ which we know, yet I think it must be conceded that changes do take place.

As an example of marked changes which can be brought about in other germs let us take the anthrax bacillus. Of all known bacteria, this is perhaps the most typical spore former. These spores retain their virulence for years under very adverse circumstances; yet it is well known that anthrax vaccine is readily produced by growing the germ at a temperature slightly higher than that at which it grows best. In from ten to twenty days a virulent culture can be so modified that it does not produce spores and will not even kill a guinea-pig.

In view of all these facts I am not yet convinced that the finding of bacilli of the human type in cases of pulmonary tuberculosis proves absolutely that the infection in the first instance came from a human being. I am not willing, however, to try and force conclusions which are more sweeping than the facts at hand warrant, and for the present, at least, must abide by the facts which have been demonstrated. The question is one which requires further study.

All the work which has been done so far gives evidence that the chief danger from bovine tuberculosis is for children. The work done in foreign lands, as well as in our own country, shows that the great majority of persons infected with the bovine tubercle bacillus are below the age of fifteen years, and bovine infection is especially marked in young children under the age of five. The evidence appears to show that the adult is not particularly

susceptible to bovine tuberculosis. This is as far as our present knowledge enables us to go, and this statement is made with the reservation concerning the change in morphology and character which may come about by residence in the human body.

More than a year ago the American Veterinary Medical Association appointed an International Commission to make a study of the best methods of controlling bovine tuberculosis. This commission, consisting of 14 members, spent a year in studying the subject and rendered a report in September of last year. This has been published by the Bureau of Animal Industry at Washington, by the Veterinary Director General of Canada, by the Conservation Commission of Canada, and by the American Veterinary Medical Association. It can be obtained from the Bureau of Animal Industry in Washington or from these other sources. The purpose was to study the principles and lay down the fundamentals for control, hoping thereby to unify the procedures on the American continent. In the United States of America we are in a particularly bad condition, as each State can make its own laws, regardless of what its neighbors wish. Only through our interstate commerce have we any unity of action at all. I would suggest that this Association do all in its power to spread this report, and assist in having laws enacted in the various States which are in consonance with the fundamentals there laid down. The commission supported the tuberculin test as a safe and early means of diagnosis—in fact, the only reliable means known.

It further recommended the rearing of healthy herds from tuberculous mothers by a modification of what is known as the Bang method. Wherever large numbers of cattle are found in any herd which show tuberculosis, the herd must be regarded as infected, and all animals in that herd should be treated as infected. The Bang method, as first practised, permitted the separation of reactors from non-reactors. This method, however, we consider as containing some dangerous features. Where the herd has only a small number of tuberculous animals, the reactors may be separated from the non-reactors, and the latter may be admitted under strict regulations into healthy herds. From the offspring of both classes of cattle a healthy herd may be reared. In addition to this, strict quarantine must be observed, and no tuberculous animals be admitted to any country or State. It is impossible to abstract this entire report in this paper, but these are some of the fundamental principles which seemed to me to be more important.

In conclusion, let me say that in the light of our present knowledge we must admit that man is the chief source of danger to man. However, I

personally believe that the percentage of bovine infection in the human being is much larger than is generally recognized. It is our duty, therefore, to demand laws of our legislators enabling us to suppress bovine tuberculosis, which is at once an economic scourge and a menace to human beings. This should be a strong feature in our propaganda for preventive medicine.

DISCUSSION ON DR. RAVENEL'S PAPER

Dr. Harold J. Stiles, Edinburgh, Scotland: Mr. President and gentlemen: I am very glad to avail myself of this opportunity to say a few words about the subject of bovine tuberculosis, in which I personally am obliged to be very much interested. In fact, I happened to be here today on my way to Los Angeles to read a paper before the American Medical Association on the pathology and treatment of bone and joint tuberculosis in human subjects.

With regard to Professor Koch's original view, which he put forward in 1901, I may say that, on clinical grounds merely, I do not believe one single word of it, and I say this because of the appalling amount of bone and joint tuberculosis which I have seen in the Royal Edinburgh Hospital for Children, and which, I have no doubt, is prevalent throughout the whole of Scotland. So prevalent is it that those of my American and Canadian colleagues who occasionally do me the honor to visit the children's hospital during my operating days are astonished at the number of operations we have to perform on bones and joints.

When I began to make some inquiries into the milk conditions in Edinburgh, I soon found that nearly all the physicians seemed to regard milk as almost the only suitable food for children. I admit that milk is the best food and the most convenient for young children, but I do not admit that milk should be the only food that the child receives. I think it is much better for young children to have a good mixed diet. I admit that there is much more trouble in cooking meals than in simply handing them a glass of milk and a biscuit. I am a little heterodox in my views as regards feeding children.

When I began to look into the milk question in Edinburgh, I soon found what I considered to be quite an adequate explanation for the amount of bovine tuberculosis, not only in large towns, but in rural districts. We have absolutely no proper control of the milk supply in our cities, and I think absolutely none in our rural districts. I think I am right in saying that in Edinburgh we have about 80 of what we call byres, and about

2000 cows are milked every morning. We have one veterinary inspector for these 2000 cows. If he should find a cow with a tuberculous udder, he has no power to order that cow to be slaughtered. All he can do is to order it out of the city. What happens to it? The probability is that it finds its way into the rural districts, is probably bought by a small farmer or plowman who has got half an acre of ground and a cow, and the families in the surrounding district get their milk from this cow. It calves again and supplies milk. I understand that about 200 cows are imported into Edinburgh every week to take the places of those that run dry. Not one of these is inspected outside before it enters, so that we may start by saying that the milk supply in Edinburgh in not certainly free from tubercle bacilli. Furthermore, the municipality has done nothing to provide the children of the poor with milk free from tubercle. If the parents of the children knew that, I think they would hesitate about giving their children milk without boiling it or pasteurizing it. If they like to give the children raw milk, they must do so and take the consequences. It is not fair to expect the children of the poorer classes, who are ignorant of these things, to be practically compelled to drink infected milk.

Let us pass from that to what I may term the clinical evidence in favor of a large percentage of what I shall call surgical tuberculosis of the bones and joints in children, and glandular and abdominal tuberculosis. Let us see what the clinical evidence is. Is there any clinical evidence to show that a large percentage of the cases of surgical tuberculosis in children is of bovine origin? I think there is, and I will give you an example of the kind of evidence which we are constantly getting. I will take simply two cases which have occurred within the last six months. In going around the wards we found a child of eighteen months with multiple tuberculous joints, with tuberculosis in the frontal bone, abdominal tuberculosis, and probably tuberculosis elsewhere. Two of my assistants, both of whom have been house surgeons, are quite familiar with the pathological and clinical findings in these cases. These two assistants are working at nothing else—one on bone and joint tuberculosis, and the other on glandular tuberculosis. The one who is working at glandular tuberculosis is also taking up especially the milk question, and whenever he sees in the wards any child with multiple surgical tuberculosis, he buys a ticket to any part of Scotland; he goes to the child's home, he gets the family history, finds out whether the parents are free from tuberculosis or not. In this case, to which reference has been made, the child was riddled with tuberculosis. He goes to the byre, and finds two out of six cows with tuberculous

udders. He brings home some milk, centrifuges it, and finds the milk teaming with tubercle bacilli. He inoculates guinea-pigs and reproduces the disease. The chain of evidence is complete, and that is the kind of work we want. We want to combine the clinical work with the pathological and bacteriological, and we want to convert a presumption into pathological proof, and if we can do that,—and we have been able to do it in every one of these cases,—we can then go to the municipality and say that those cows have been the cause of death to these children. I believe that, when we have completed this work in the Children's Hospital in Edinburgh, tedious as it is, with two men working at nothing else, we shall be able to compel the municipality to take steps to remedy this appalling condition.

Let me give you one other example from a private case: A very well-to-do man and his wife, living in Northampton, on our recommendation went to see a practitioner who had been house physician in the Children's Hospital. They brought their seventeen months old baby to him, with thickened phalanges and thickened metatarsal bones. The doctor knew this was a case of osseous tuberculosis, but the mother said the child was teething. The child was subsequently brought to me. In addition to the hands and feet being tuberculous, there was tuberculosis of the jaw, the frontal bones, and abdominal tuberculosis. The parents asked what could be done for the child, and the reply was "Nothing." The child was riddled with tuberculosis, and a bad prognosis was given. The parents said, "What is the cause of this, Mr. Stiles?" I replied, "Milk." They said it could not possibly be that. "We have two cows which we keep for ourselves, using the milk for our own consumption. They were tested six months ago and did not react." I replied, "No, they did not react because they were too tubercular; that is why they did not react." Both animals were slaughtered and found to be riddled with tuberculosis. That gentleman has since given a donation to enable us to carry on this work. That is the sort of thing we want.

Dr. William H. Welch, Baltimore: It is clear that there are certain matters which are established; there are others which are very much in dispute, and still others which we must regard as hardly approached as yet. It depends a good deal upon where we lay the emphasis. We may agree on some body of facts, and still lay emphasis more upon one than upon the other feature, and we may reach somewhat different conclusions without disagreeing as to the facts.

It is true, as Dr. Ravenel has pointed out, that Koch in his address in London certainly left the impression by the conclusion drawn from his own

words that there was practically no danger whatever of infection from bovine sources. It is true also, and the point has been emphasized in this country, that Koch did not add very materially new facts. Dr. Theobald Smith, one of the most careful workers on the subject, had previously pointed out the rather subtle morphological and biological differences between the human and bovine types. He also noticed (it was known before) that it was difficult to inoculate successfully calves or cattle with tubercle bacilli from human sources. With characteristic caution, however, he did not venture to draw the conclusion that because calves are insusceptible, relatively, to human tuberculosis, we should infer that human beings are insusceptible to bovine tubercle bacilli. That was the difference mainly between Theobald Smith's and Koch's presentation of the subject. Koch drew that inference without basis of facts. It is also true that Professor Koch at the Washington Congress somewhat shifted the position he had previously taken. He took the position that, in the campaign against tuberculosis, pulmonary consumption is the main factor to be considered. I think he stated that eleven-twelfths of the deaths from tuberculosis in human beings were traceable to pulmonary tuberculosis; that the other forms of tuberculosis—the glandular, the surgical forms of tuberculosis—were not open cases; that is, they did not figure as an important factor in the spread of the disease; therefore, those who are interested in tuberculosis as a problem with reference to the extermination of the disease might almost neglect the dangers from bovine tuberculosis; that it was upon pulmonary tuberculosis we should concentrate our attention, and that there was little or no evidence of infection from bovine tuberculosis, or that bovine infection played no particular rôle in it. Dr. Park, as you know, has come to the same conclusion at which Dr. Ravenel has arrived with reference to the rôle played by the bovine bacillus in the causation of phthisis. There have been a few cases, as has been pointed out by Dr. Ravenel, in which it is claimed the bovine tubercle bacillus has been found in phthisis, chiefly in the sputum. I know that Professor Koch considered that the most important thing, at present, was further investigation on that subject. He called attention to certain important sources of error, in butter and milk, where the bovine tubercle bacillus was present. One might readily have in the sputum the presence of the bovine tubercle bacillus accidentally, and, at the same time, playing no part whatever in the disease process in the lung; therefore, it requires much more than mere demonstration of the tubercle bacillus of bovine type in the sputum of consumptives before one could draw the inference that it was really causing the disease in the lung.

I happen to have had the good fortune to spend an hour with Professor Koch, in the Institute for Infectious Diseases, a year before he died, after he had returned to Berlin from America, and I found him engaged almost exclusively in the study of this subject. He must have collected a good deal of material and new facts. I have heard nothing about any prospect of these being published. He showed me figures and charts, all in confirmation of his previous position, that the bovine tubercle bacillus played no part in the production of pulmonary tuberculosis; that is, on the assumption that there is no transformation of the bovine into the human type. Of course, as Dr. Ravenel has stated, there is the point at issue. Koch believed there was no such transformation. That is the opinion very cautiously expressed by Dr. Theobald Smith, and I do feel that his position on anything relating to this question is almost the most authoritative one in the world; and he thinks that the evidence is, to say the least, very inconclusive; that here is a point for further work, and research along this line ought to be followed out. There have been a few scattered observations. An attempt has been made to determine whether or not the bovine tubercle bacillus is transformed into the human type in human beings, namely, by studying those light neutrophilic warts so commonly seen on the hands of butchers, to try to find out whether they contained the bovine type of tubercle bacilli. There is nothing easier than to get such material on which to work. These warts remain on the hands of butchers for a considerable time, and if one could get the histories of years and years, and has a chance of using that material, the results of such investigations might be valuable. I think it ought to be had in great abundance in Chicago. We must have opportunities of studying these warts and seeing whether we get a transformation of this type of bacillus. One investigator has come to the conclusion from considerable clinical examination that there was such a transformation of the tubercle bacillus, with apparent preservation of virulence, indicating that the bovine type was due to the fact that the animal had spontaneous infection from another source. That case has been analyzed and the proof found inconclusive. These are more or less, I think, facts on which there can be general agreement. I myself am disinclined to the view which Dr. Ravenel favors as to the transformation of type. One should be open-minded on the subject and consider it still *sub judice*. There are so many sources of error which we have to consider in connection with this work. If you have inoculated a cow with the human type of tubercle bacillus, what appears to be a transformation, as indicated by the production of a generalized tuberculosis in the calf, is really the result of your experimental inocu-

lation, and not the result of spontaneous infection. That is a difficult matter to control. Mr. Stiles has stated most impressively his views on this subject, giving us a series of fatal cases, making a very notable percentage, to say the least, of fatal cases of tuberculosis in human beings, chiefly in children. If you let these cases run they will doubtless play an important rôle in the spread of the disease from person to person, and they are of significance from every point of view, particularly from a humanitarian standpoint.

Shall we do anything to check that large mortality? I think one can accept all the facts which Koch himself admitted at Washington, and still maintain that it is of importance to recognize that there is serious danger from the infection of human beings from the milk of tuberculous cattle, and that while human sources are far more important in the spread of the disease, we should not by any means neglect the other. The character of evidence which Mr. Stiles has brought forward here is one deserving of every respect, and more especially by physicians, who do not have to discuss some of these more subtle laboratory points. Koch himself realized that in his London address he took the position that there was very little evidence of primary alimentary infection. There are extraordinary differences as to the incidence of tuberculosis according to locality. To bring that into exact relation with the milk supply has been difficult. While the experience of Edinburgh which Mr. Stiles has presented is very important and apparently conclusive on the points he has brought before us, still in Kiel and in Vienna they claim they have scarcely any primary intestinal tuberculosis, and, of course, we are informed by Kitasato that in Japan, where milk is not used, and where there is little or no tuberculosis among cattle, they have the same types of glandular and bone and joint tuberculosis, and can exclude positively the milk. These statistics we find are interpreted somewhat differently. However, the high percentage of deaths mentioned by Mr. Stiles teaches us the great importance of such clinical facts as he has brought before us, so that my opinion is that we are justified in insisting upon a better control of the purity of the milk in our cities. It is the great sanitary problem of today. It is a great white river, and it is just as much a river as the water flowing through our cities, but it is more difficult to keep pure this great white river of milk. It is just as important, nevertheless, and the most urgent problem before our municipal health authorities today is the protection of the milk supply.

Dr. Thomas D. Tuttle, Helena, Mont.: The question of whether the bovine tubercle bacillus will produce consumption is one of great importance,

but it does not make any difference to me particularly whether my child dies of bovine tuberculosis in its glands and joints, or whether it dies of pulmonary phthisis as the result of infection. I believe that the work of prevention of tuberculosis is as important to the child as it is to the adult, and I do not believe we should attempt to confine our work to the prevention of pulmonary tuberculosis. If we are going to stop tuberculosis in the child, we have got to stop it in our milk, and we cannot stop it by simply making examinations for tuberculosis of udders. We have got to go deeper into the subject.

In Montana, eight years ago, we started this work. A law was passed then requiring that all dairy cattle be treated with tuberculin, and if found to react, they must be killed. We secured the enactment of that law to protect the public health; but we showed the dairyman that we were protecting his cows also, as other cows would eventually become infected by the tuberculous cow.

As soon as we put this law into effect we had some fireworks. It created a great stir. A gentleman last night spoke of giving due publicity to the cows that had been tested and condemned on account of tuberculosis. We did that. We sent up some fireworks and the stick came down. The dairyman was entitled to some protection. In one dairy there were 12 cows out of 180 that were found tubercular. The fact was published that these cows would be slaughtered on account of tuberculosis, and the result was his business was entirely killed. Our legislature met again in 1905, and we were unable to get an appropriation to carry on the work. Again in 1907 we failed, and also failed in 1909. In 1911 we got through a different bill. The work was put in the hands of two boards. We started this work on the fifteenth of April of this year, and up to the time I left Montana there had been 150 tuberculous cattle killed. Nobody knows in whose dairy these cattle were killed. The dairymen are satisfied. They are glad to get rid of their tuberculous cattle, and any State can put such a measure into operation if it will; but as long as you ruin the dairymen by advertising that you are going to kill a few of their tuberculous cattle, they will make a hard fight, because it is bread and butter for them. Nevertheless, we have got to kill these cattle if we would protect the children. I do not care whether I die from a long, short, fat bacillus or a thin one; but I don't want to die of either one.

Dr. Glover, Fort Collins, Colo.: I did not expect to be called upon to discuss this paper or to say anything on this subject. However, since I have been asked to do so I will say a few words.

I am president of the American Veterinary Medical Association, the body that appointed the commission that has been referred to, and I am head of the Veterinary College at Fort Collins. We have a proposition here in our State to contend with respecting tuberculosis. We have been unable to get much effective legislation. In regard to whether the causative factor is a short bacillus, a long one, a fat or lean one, it really makes considerable difference. We want to know the source of this disease in the human in order that we may fight it. I believe the evidence is becoming stronger and stronger all the time that bovine tuberculosis is transmissible, especially to children, but our work is largely along the line of the cause of the disease in the lower animals. But from what I have read, I have assumed that the general opinion now is that the disease is transmitted more by ingestion than by inhalation; that the germs do not ordinarily pass through the unbroken respiratory mucosa, but that they are absorbed readily through the intestinal mucosa. They adhere closely to fat-globules, absorbed through the lacteals and the thoracic duct, and through the venous blood reach the right side of the heart and the lungs. I believe that the location of the foci in the lung would indicate that they are not so much at the termination of the bronchioles as in the capillaries, indicating infection through the pulmonary arteries. At any rate, very little dust inhaled gets down very deep into the lungs, where the diseased area is usually first found.

I do not wish to discuss the scientific phase of this question in the presence of these noted scientists; but as there are citizens of Denver and of the States here listening to what you men are saying who have children, I want to appeal to them by saying that the time is coming when we will want their aid in matters of legislation to protect the children, the boys and girls, of this State, as well as the livestock interests. This thing is coming, and we must be ready. From an economic standpoint, it is of the utmost importance that we handle this proposition. The disease is growing worse. In hogs especially it is becoming a serious proposition. It looks as though the hog industry is in jeopardy. It is not anything like as prevalent in cattle out here as it is in the East, but still we have it. A number of hogs were placed with tuberculous cattle, some of them prize winners at the St. Louis World's Fair, and associated together for one year, and it is my recollection now that three-fourths of the hogs contracted the disease from the cattle. We believe that the disease can be contracted from the bovine by the human. We have no laws in this State which will enable us to handle this provision. We have in Fort Collins a municipal ordinance,

and every tuberculous cow was run out of the city over two years ago. We have no tuberculous cows in that city now, and we are glad to observe that Colorado Springs, Cañon City, and Denver are waking up to the proposition of municipal control. There is not much use in enacting ordinances that are in advance of the people, yet such ordinances are in themselves educational. It is a good thing to keep people thinking about these things. So I think we all feel, after hearing the talks of these gentlemen, that it is of the utmost importance that we look to the health of our cows. God bless meek-eyed "Bossy" when she is healthy, and when she is not, let us bury her six feet "perpendicul."

Dr. Gerald B. Webb, Colorado Springs: I understand it is possible to get dairy herds free from tuberculosis and to keep them so. This, however, costs much money.

The vaccination of cows against tuberculosis by means of inoculations of the human tubercle bacilli has not been very successful.

I would like to suggest especially to Drs. Ravenel and Glover that the attempt be made to vaccinate calves with virulent bovine bacilli in a manner similar to that with which we have succeeded with laboratory animals, and more recently with monkeys and two children. The principle of this method is successive inoculations of increasing numbers, using the Barber technic for isolating the bacilli. It might be found safe to inoculate calves with possibly 500 bovine bacilli, then 5000, and lastly 5,000,000, and the necessary protection against infection so insured.

Dr. Alfred Meyer, New York: I am only a clinician, but I have been immensely interested in what Dr. Ravenel and Dr. Welch have said. If I am not mistaken, neither of these gentlemen, in the historic review given on this question, has referred to some of the work reported at Washington by Professor Detre, of Budapest. That work at the time apparently promised a great deal. Professor Detre appeared before the International Congress on Tuberculosis at Washington with a suggestion and demonstration of the value of the diagnosis between the two types of infection, clinically speaking, by the inoculation of a patient with either tuberculin from a human source or tuberculin prepared from a bovine source. I have kept fairly well in touch with the medical literature of the question since three years ago, but I have failed to discover any fruitage of that very important work.

Dr. Ravenel referred to the clinical diagnosis of tuberculosis as being made now by varying the dosage in the guinea-pig. According to Detre's

work and the method he used, it was not dependent upon dosage, but upon the source of the preparation of the tuberculin.

As a clinician, I would like to ask any of the bacteriologists present as to the present view of research men on that matter, and what has appeared in the literature of the subject since, so that we medical men may know what the present status of the question is.

Dr. William H. Welch, Baltimore: I will say that there is little or no value attached to the method of differential diagnosis which Detre advised.

THE SPECIFIC TISSUE INOCULATION OF VACCINES

By Gerald B. Webb, M.D., and G. Burton Gilbert, M.D.
Colorado Springs

Those who, since Wright's brilliant discoveries, have been engaged in vaccine therapy have met with many splendid results, and at the same time with many dire failures.

Certain conditions have yielded to vaccines better than others, and the failures cannot be understood as easily as the successes can be appreciated. Horder[1] writes: "My opinion is that vaccine therapy is an effective method of combating an important factor—it may be the most important factor—in the struggle between the tissues and many infecting agents. I believe, however, that there are other factors in this struggle which are not touched by the use of vaccines, and that this natural limitation does exist, though at present it is quite undefined."

Boils have generally yielded rapidly to the injection of staphylococcous vaccine, yet other staphylococcous infections, such as staphylococcous acne and staphylococcous nasal infections, have frequently proved most intractable.

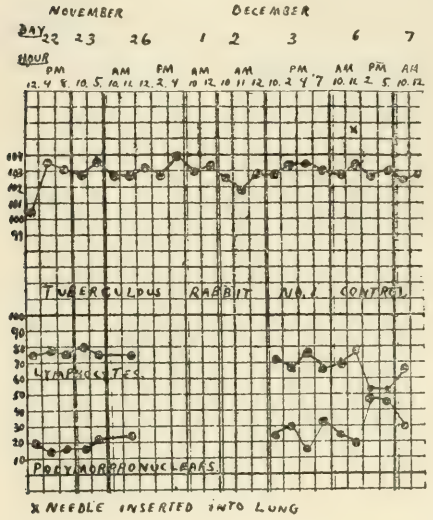
Tuberculosis of the subcutaneous tissues and tuberculous lymph-nodes have received decided benefit from the subcutaneous inoculations of T.R. and the results of such treatment have been decidedly gratifying. Yet lupus and pulmonary tuberculosis have not yielded, by any means, as well to similar treatment.

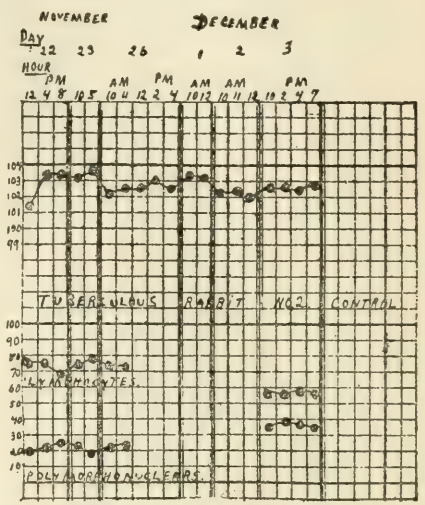
Gonococcous arthritis has been reasonably easily controlled by inoculations of gonococcous vaccines, yet the original foci of infection and gonorrheal infections of mucous membranes have proved very intractable.

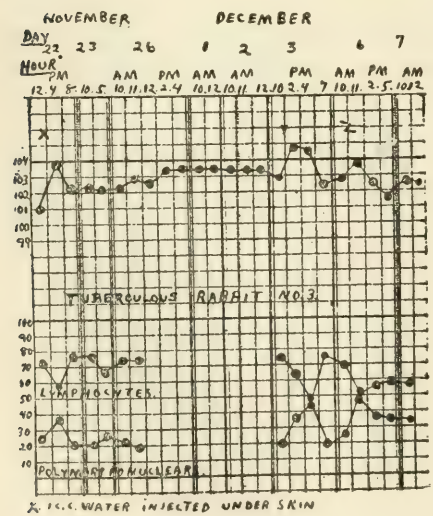
For some time we have felt that the cell factor in infection had been greatly neglected, and the work of Hort,[2] who has carried out experiments on autotoxemia, has been corroborated, as the charts on page 376 will indicate.

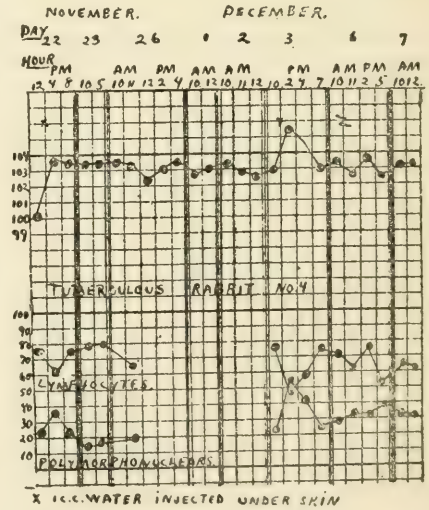
Water is a protoplasmic poison, and when injected into rabbits suffering from bovine tuberculosis, led to the production of fever, as indicated.

The differential leukocyte counts, as charted, would seem to us to be even a more delicate test of the tissue disturbances than the temperature curve, as suggested by Hort.









The disturbances of the leukocytic picture and of the animal's temperature, we take it, must result from an autotoxemia induced by the destroyed tissue-cells.

Such destruction of tissue-cells must take place in all bacterial infections, and the poisoning of the host would be expected to vary according to the composition of and the type of enzymes in the specific tissues.

According to Ehrlich's[3] side-chain theory, the cells which anchor toxin and bacteria must themselves develop the antibodies to these. It would seem, therefore, that the injection of vaccines into tissues similar to those infected would stimulate that type of tissue to produce antibodies.

Ehrlich's theory in this regard has not, however, been fully borne out by experiment, and the belief is current that the blood-forming centers, such as the bone-marrow, spleen, lymph-nodes, and, more especially, the lymphocytes themselves, are the sources from which antibodies originate.[4,5]

Ehrlich's theory may be used to consider why certain tissues are more readily attacked by certain bacteria.

The tubercle bacillus rarely attacks a muscle, yet frequently attacks the skin. It may be considered that the muscle-cells have abundance of receptors for this bacillus, but that the skin-cells have but few receptors.[6] To the muscle, then, the bacillus may be considered perhaps in the light of a food-stuff, whereas to the skin-cells it might be considered in the nature of a poison.

The injection, then, of dead tubercle bacilli into a muscle, when the skin is suffering from tuberculosis, would hardly be expected, in the light of this theory, to produce the stimulation necessary for the production of antibodies by the system that the injection of the dead tubercle bacilli into the skin itself would.

Apart, however, from the necessity for the production of antibodies to the bacteria we have in infections probably more complex situations to consider.

Some factor has led to the loss of immunity of the local tissues, and this factor, together with the action of toxins from the bacteria which have gained entrance, will now lead to the spread of the disease.

It is quite probable that some perversion of the enzymes naturally inherent in specific tissues may aid in the invasion by the bacteria.

Destruction of similar cells by the injection into their midst of vaccines would then be expected to lead to the production of antibodies to the diseased tissue-cells and their unrestrained enzymes.

The injection of specific vaccines, especially if prepared in distilled water,

into specific tissues would reproduce the complex picture of the area of infection, and such a condition would especially be expected to stimulate the healing of the diseased area, both by stimulating the system to the production of necessary antibodies and also possibly by more perfectly inducing a reaction at the local area of disease.

When we come to analyze the results in vaccine therapy, it is found that, generally speaking, mesoblastic infections have yielded best to subcutaneous injections of vaccines. Epiblastic and hypoblastic infections have not yielded so readily. The best examples already referred to have been the cure of boils and subcutaneous tuberculosis by the subcutaneous injections of the appropriate vaccines.

The following case deserves reporting, as much in regard to its mode of origin as in its alleviation:

Mrs. C.;* age, forty-one. Mother of five children. For fifteen years has lived partly in Illinois and partly in Colorado. History in general negative, except that she is of Irish descent.

For ten years she has noticed enlarged cervical lymph-nodes, especially on left side. To ascertain the nature of these, Dr. J. B. Murphy, of Chicago, November, 1909, gave three inoculations of old tuberculin, with no reaction. Ten days following the last dose her face and nose broke out with what at first was considered erysipelas, and temperature rose to 105° F. The condition all cleared away except a patch on the right side of the nose.

In April, 1910, Dr. Murphy again gave tuberculin tests, the second injection causing a reaction with temperature rise to 105° F. Ten days later her right ear itched and burned, and patches came out all over her face, typical of lupus erythematosus, which did not disappear again.

Patient was then treated with the subcutaneous inoculations of small doses (up to $\frac{1}{5000}$ mgm. O.T.) of tuberculin for upward of five months.

No improvement took place, and the patches were intensely angry looking when first seen by the authors in November, 1910.

The area involved was quite extensive: six small patches around right eye, three around left eye, and some on each side extending to conjunctiva.

The lobes of both ears were covered anteriorly, and one large and five small patches were on right cheek. Five small patches and two fairly large patches on left cheek, and the major part of bridge of nose was covered, the disease spread thence more to the right cheek than to the left.

* Since the above was in type Dr. Murphy kindly sent us the history sheet of this patient, from which it appears that the first note of skin disease was made June, 1910, when a dry, scaly, eczematous looking patch was observed on the lower lobe of the right ear.

The pathology of lupus erythematosus is not yet understood, the weight of opinion being against the tubercle bacillus as the cause. German observers have occasionally claimed its origin following a tuberculin reaction, but MacLeod[7] claims this has never happened. Considering the mode of development in our case, it may prove to be in the nature of an anaphylactic condition to the tubercle toxin.

Some authors[8] have classified lupus erythematosus with lichen scrofulosorum, folliclis, and acnitis, among the tuberculides, as lesions due to the tubercle bacillus or its toxin, but which do not constantly produce tuberculosis in guinea-pigs when such tissues are injected.

Arndt,[9] using the antiformin method, by which Krüger[10] constantly showed especially the Müch gram-positive form of tubercle bacilli in lupus vulgaris cases, found acid-fast tubercle bacilli and also the Müch form in two cases of lupus erythematosus.

Morris[16] states that the intensity of lupus erythematosus varies in a cyclical manner, but after a more or less protracted period it tends to recovery.

Considering the fact that this patient had received no benefit from the subcutaneous inoculations of tuberculin, and with the specific tissue inoculations in mind, intradermal inoculations of T.R. were started.

The first dose, $\frac{1}{100,000}$ mgm., was followed almost at once by alleviation of the intense redness and burning. This injection and the subsequent injections were made into the skin of the forearm in a manner similar to that employed for cocain anesthesia.

The patient presented herself again after a week, and it was noticed that the inoculation site bore a striking resemblance to the patches on her face.

Inoculations were continued at weekly intervals until a dose of T.R. $\frac{1}{10,000}$ was reached. In all, some 15 inoculations were given.

As several acne pustules containing Staphylococcus albus were observed on the face from time to time, 50,000,000 cocci of a vaccine prepared from this organism were added to the tuberculin inoculations.

The lupus erythematosus patches gradually disappeared from the face, and when last seen, only the nasal patch remained distinctly, and that in part only. The cervical lymph-nodes, not very markedly enlarged, have not been in the least benefited by the tuberculin inoculations.

In the past few years we have had many experiences in the treatment of eczema with staphylococcous vaccines. We have seen great benefit from the subcutaneous inoculation of stock staphylococcous vaccine in the weeping variety of eczema and in cases of staphylococcic dermatitis. We were,

however, discouraged in its use in cases of what appeared simple eczema affections.

Forsyth[11] has called attention to certain forms of eczema, possibly being anaphylactic sequels of staphylococcous infection, and the following cases would appear to corroborate his ideas:

Mr. B., Christmas, 1910: Felon of finger of right hand. Incised: cured.

January 10th: A large patch of eczema occurred, covering each forearm; larger on the right. For three weeks salves and internal medication were tried in vain.

In February a small acne pustule was noticed at margin of patch on the right forearm, and it was decided to give an intradermal injection of 50,000,000 stock staphylococcous vaccine.

Within three days the entire condition of eczema had disappeared.

Mr. O., organist. April 2d: Dug the garden for planting. Two large blisters developed on right palm. Ten days later eczema appeared, covering both axillæ, and extending over chest and upper part of arms. The area on the right side was greater than that on left. The patient was referred by Dr. P. O. Hanford, who stated that, in his experience, medical treatment in such cases had been most unsatisfactory.

An intradermal inoculation of 50,000,000 staphylococcous vaccine caused decided amelioration in five days, and a second similar injection brought about complete cure.

Several other similar cases have been treated, with equally good results. In one case, although improvement was brought about, a reaction followed each dose and no cure was effected.

We have applied the same principle to two cases of erysipelas, both resulting in a cure in forty-eight hours.

Numerous cases of acne due to the acne bacillus and staphylococcus have been benefited and, for the time being, cured, when subcutaneous inoculations in the same cases had met with little result.

Infections of the nasal sinuses and antra, due to pneumococcus and Micrococcus catarrhalis, have been satisfactorily treated by injections of autogenous vaccines into the nasal mucous membranes.

Our colleagues, Dr. Dennis and Dr. Patterson, have both independently found that very small amounts must be used in comparison with what would be injected subcutaneously.

In one patient with antrum of Highmore infection, subcutaneous inoculations up to 250,000,000 of a mixed autogenous streptococcus and

Micrococcus catarrhalis vaccine brought little improvement and no focal reactions.

The intranasal mucous membrane injection of only 20,000,000 of the same produced a virulent reaction in the antrum, followed by some improvement. We were then led to attempt to produce immunity to nasal colds by spraying the nasal mucous membrane with a vaccine prepared from a victim of the prevailing epidemic.

As an example, in a household of 10 the only person escaping the epidemic was the cook, whose nose was several times thoroughly sprayed with a mixed vaccine containing pseudodiphtheria bacilli, Micrococcus catarrhalis, and pneumococci. The amount sprayed was equivalent to 250,000,000 bacteria each time.

In the autoinoculations following graduated exercise in pulmonary tuberculosis a similar principle perhaps holds good, and those who employ such treatment have felt their results superior to the treatment by the subcutaneous inoculation of tuberculin.

Latham[12] has advocated the stomach administration of vaccines for pulmonary complaints. The doses he recommends have been much more minute than usually advised for subcutaneous inoculations.

We have in his method a disease of a hypoblastic structure, treated by a hypoblastic ingestion of appropriate vaccines.

We have administered T.R. by the mouth in some fifteen cases of pulmonary tuberculosis. The first dose has always been $\frac{1}{75,000}$ mgm. T.R. The dose has been given in a wineglass of water one hour before breakfast every five to seven days. In several patients before $\frac{1}{30,000}$ T.R. was reached temperature reactions would occur to 99° or 100°F. on the day of treatment. Even with this small dosage in several cases we have had to discontinue the treatment on account of malaise, headache, slight temperature rise, etc. Several cases were decidedly benefited and their improvement has dated from the beginning of this treatment. We have hardly ever known such disagreeable symptoms follow the subcutaneous inoculation of such small doses of T.R.

In antityphoid inoculation a final dose of typhoid vaccine, given by mouth, might perhaps be found to improve upon the results so far obtained.

In some recent experimental work with *Macacus Rhesus* monkeys, we have found it possible to sensitize the dermis to tuberculin. Krause[13] has reported the sensitization of guinea-pigs by intradermal injection.

We[14] have reported a case where it seemed that the conjunctiva had been sensitized to tuberculin, and recently[15] work has been published describing

experiments in which the conjunctival mucous membrane has been successfully sensitized to tuberculin.

By means of the Moro tuberculin salve it is possible, by making inunctions at intervals on various parts of the body skin in a person reacting positively, to produce repeated reaction in previously inuncted areas.

Specific tissues can, therefore, be sensitized to a specific bacterioprotein, and the injection of dead bacteria into such tissues may be expected to produce more specific effect.

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DISCUSSION ON THE PAPER BY DRS. WEBB AND GILBERT

Dr. William Charles White, Pittsburgh: It has been extremely interesting to me to hear Dr. Webb's paper. We have arrived with tuberculin in the matter of reaction at practically the same conclusion as Dr. Webb has arrived at. Our paper is now in the hands of the publishers on this very point, although we have gone a little around Dr. Webb's conclusion, but I believe that the antibodies, after the use of tuberculin, come from the skin-cells. I think that the intradermal method of inoculation of tuberculin produces these substances which are useful for the improvement which comes from the use of tuberculin in pulmonary tuberculosis.

I hesitate to speak of our results lest I be accused of saying something that is not true, but having tried the method which we have spoken of for about two years with a view to determining the sensitiveness of the surface of the cells of the body to the tuberculin poison, and with a mathematical

scheme having arranged the dose largely subcutaneously, the reaction of the surface cells of the body to a definite size is determined on the basis of skin sensitiveness from the cutaneous application of tuberculin. This method we have carried on now for three years without a single failure; but we have gone further, and, having determined the dose on the sensitiveness of the surface cells, we have put tuberculin in the muscles subcutaneously and into the different tissues. We have tried the influence of different tissues on the tuberculin in the matter of securing a reaction on the surface within the dermal cells of the body, and we have come to a conclusion exactly similar to that of Dr. Webb—that it is the dermal reaction, *i. e.*, the cells of the dermis itself, which produce the substances which are valuable in reaction back upon the lung as well as in the tuberculosis which exists in most cases which came under our care.

It has been especially pleasing to me to have heard the results which Dr. Webb has arrived at from his own work.

Dr. G. W. Morse, Denver: I have one case of acne vulgaris that Dr. Webb became interested in. I will have to give you the facts in the case largely from memory.

About eight months ago one of the surgeons in the city brought to me a case of acne vulgaris, in a young lady, and asked for a vaccine. Under aseptic precautions, I took a comedo from two separate places and planted it out; one on the ordinary nutrient agar, and the other on glycerin oleate, hydrochloric acid agar, recommended by Gilchrist. At first I thought my results were sterile. After leaving it in the incubator for perhaps two weeks I noticed I was getting a growth, a pure growth of the acne bacillus, not contaminated with staphylococci. The comedo when smeared on the slide gave the best specimen of pure culture of acne bacillus I ever saw obtained in that way. I made a vaccine from the acne bacillus and turned it over to the surgeon in charge of the case, with also a stock staphylococcus vaccine. I instructed him to use it by the subcutaneous method, which we were using, giving a dose of, in the case of acne bacillus, not to exceed ten millions, and in the case of staphylococcus, about one hundred to one hundred and twenty-five millions. He worked with the case for some time; the results were not good, they were not encouraging. It was such a good case to work with, and we were so sure of what the infection was, that I wanted to follow it up to see what there was in it. We have been disappointed in working with vaccines and our patients have been disappointed. I am not an enthusiast on the subject of vaccines. I have had too many failures, but I do use them to some extent. I went to work and made two more vaccines, and in the

second attempt I got contamination with the staphylococcus. I introduced these vaccines by the subcutaneous method, and was not able to get good results. I increased the dosage to see if the vaccines were potent. I gave from thirty to forty millions in acne, and made the patient worse. At about this time I opened correspondence with Dr. Webb and got a hint from him about the intradermal method and his method of decreasing the dose. I tried it, and after two months, being careful to give the dose into the skin itself, and giving very small doses, the case is very much better. My dose now is two to three millions of the acne bacillus, and not to exceed fifteen to twenty-five millions of the staphylococcus. The last time I saw her there was nothing to be seen but the scars remaining from the old pustules, and in running the fingers over the skin it was found that no new pustules were forming, with the exception of one or two in the region of the chin. It is the best result which we have been able to get by any method of treatment.

There is only one thing I have to say that bears on the case: those last two vaccines I made I did not kill by heat. I killed them with a small quantity in solution in distilled water of iodin and potassium iodid. I tried that as an experiment. I happened to be working with iodin in trying to find out its germicidal power, and I find it is an extremely efficient germicide when used outside of the body in test-tubes. Half a milligram of iodin with a milligram of potassium iodid in solution, in distilled water, put into about six c.c. of salt solution, which contains all the staphylococci you can grow in a tube of agar, and washed off well, will usually kill them at once. I do not believe that vaccines killed in this way are any more valuable than vaccines killed by heat. I simply mention this for what it is worth.

Dr. L. S. Peters, Silver City, New Mex.: Regarding tuberculin administration, Dr. Bullock and I have, for a short time,—about six months,—been giving tuberculin inoculations by a rather different method than has been done in the past. It is rather a radical departure from the former method. We use Denys' filtrate, and start in with a new dose, much lower than heretofore given, beginning with one-millionth of a milligram. The most favorable cases for this method are those running 99° to 100° F. We gradually increased the dose until we got a drop in the temperature. When we got a drop in the temperature, we held the dose right there until we got a rise again, and after that rise we increased one point, and usually we got another fall in the temperature. After that fall we continued that raised dose repeatedly until we got another rise. That has worked out successfully in our examinations of 36 cases in which we have used this method.

Dr. Webb, Colorado Springs: We have found it possible in monkeys to sensitize a specific tissue to tuberculo-protein. It was shown formerly, although contradicted, and yet shown again, that one can sensitize the conjunctiva to tuberculin.

It would seem to me that perhaps the most significant fact resulting from our work has been the remarkably small doses of tuberculins and vaccines that must be employed when specific tissues are inoculated. This fact seems to stand out in a varied group of bacterial infections, and, therefore, would seem of itself to indicate that the specific tissue inoculations of vaccines is not entirely theoretical.

A STUDY OF THE LEUKOCYTES IN 100 CASES OF PULMONARY TUBERCULOSIS

By Henry D. Chadwick, M.D., and Roy Morgan, M.D.
Westfield, Mass.

The following work was undertaken to determine, if possible, whether the leukocyte count in consumptives bears any constant relation to the stage of the disease. We also desired to find something in the blood-picture to aid in prognosis, and, further, to see the effect on the white count of sanatorium treatment at a low altitude. The work was all done on patients at the Westfield State Sanatorium at Westfield, Mass.

Our figures showed such wide variation in cases of apparently equal severity that it was decided to analyze them further, in the hope that the counts could be correlated with some factor of the disease other than the classification. Our results were, therefore, grouped according to—

(*a*) Age.
(*b*) Duration of disease.
(*c*) Hemoptysis.
(*d*) Amount of sputum.
(*e*) Fever.
(*f*) Pulse.
(*g*) Cavity.
(*h*) Favorable or unfavorable.
(*i*) Loss of weight.

Counts were made on 100 cases at the time of admission. The results are embodied in the tables on pages 387–390.

In the "hemoptysis" table the column marked "yes" represents cases which have had a definite, free hemorrhage at some time. The "no" column represents cases which have never had a hemorrhage or have only streaked. In estimating the temperature and pulse, the marks taken were the highest temperature and pulse recorded during the first week of residence.

TABLE A.—LEUKOCYTES.

		5–10,000	10–15,000	15–20,000	5–6000	6–7000	7–8000	8–9000	9–10,000	10–11,000	11–12,000	12–13,000	13–14,000	14–15,000	15–16,000	16–17,000	17–18,000	18–19,000	19–20,000	20,000 +	Average per c.mm.
Class	I.	22	9	1	4	4	3	3	8	4	2	2	..	1	..	1	..	..	..	..	9,218
	II.	9	13	2	..	..	3	1	5	5	4	2	1	1	1	..	1	..	..	2	12,125
	III.	8	25	8	2	..	2	1	3	8	2	7	1	7	6	..	..	..	2	1	12,719
Age	10–20.	6	7	3	..	..	1	1	4	1	2	3	..	1	2	..	..	..	1	..	11,946
	20–30.	14	19	5	3	2	3	2	4	8	2	4	2	3	3	1	..	..	1	2	11,757
	30–40.	11	9	1	2	1	3	2	3	5	1	2	..	1	1	..	..	..	..	1	10,722
	40–50.	4	3	2	1	..	1	..	2	1	1	..	..	1	1	..	1	..	..	..	11,996
	50–60.	2	5	..	..	..	..	..	2	1	..	1	..	3	..	..	..	..	..	..	11,434
	60–70.	2	3	..	..	1	..	..	1	1	1	1	..	..	..	..	..	..	..	..	10,080
Duration of Disease	3 mo.	9	5	1	1	..	..	2	6	1	..	2	..	2	..	..	..	..	1	1	11,875
	3 –6 mo.	6	12	2	1	1	2	1	1	5	1	4	..	2	1	..	1	..	..	1	11,668
	6 mo.–1 yr.	11	10	4	1	1	4	1	4	3	2	3	1	1	3	1	..	..	..	..	11,103
	1 –2 yrs.	5	7	1	2	1	..	1	1	1	2	2	1	1	..	..	..	..	1	..	11,039
	2 –4 yrs.	5	6	2	..	..	2	..	3	2	2	..	..	2	2	..	..	..	..	..	11,446
	4+ yrs.	1	2	1	1	..	..	..	..	2	..	..	..	..	1	..	..	..	..	1	14,180
Hemoptysis?	Class I: No	13	8	1	2	1	2	3	5	4	2	2	..	..	1	..	..	..	..	..	9,912
	Class I: Yes	9	1	..	2	3	1	..	3	..	1	..	..	..	..	..	..	..	..	..	7,690
	Class II: No	3	10	1	..	..	1	..	2	4	2	2	1	1	..	..	1	..	..	1	12,253
	Class II: Yes	6	2	1	..	..	2	1	3	1	1	..	..	..	1	..	..	..	..	1	12,020
	Class III: No	6	13	3	1	..	2	..	3	4	2	3	1	3	2	..	..	..	1	..	12,448
	Class III: Yes	2	12	5	1	..	..	1	..	4	..	4	..	4	4	..	..	..	1	..	13,053
Sputum	0 oz.	8	5	1	2	..	2	1	3	2	2	1	..	..	..	1	..	..	..	..	9,777
	0–1 oz.	18	19	4	3	3	3	3	6	6	1	5	2	5	2	..	..	..	2	2	11,480
	1–2 oz.	2	3	3	..	..	..	..	2	2	..	1	..	..	2	..	1	..	..	..	12,462
	2–4 oz.	7	9	..	..	1	3	1	2	2	3	2	..	2	..	..	..	..	..	1	11,147
	4–8 oz.	2	8	3	..	..	..	..	2	3	1	2	..	2	3	..	..	..	..	..	12,440
Cavity?	No	3	5	1	1	..	..	1	1	..	..	3	..	2	1	..	..	..	..	1	12,920
	Yes	4	13	5	..	..	2	1	1	5	1	2	1	4	5	..	..	..	..	..	14,545
Temperature	99°	18	15	..	3	1	4	2	8	8	2	2	..	3	..	..	..	..	..	1	10,432
	99°–100°	13	17	4	2	2	3	2	4	6	3	4	1	3	3	1	..	..	..	1	11,103
	100°–101°	6	6	4	1	1	1	1	2	2	1	2	1	..	3	..	..	..	1	..	11,741
	101°–102°	2	4	2	..	..	..	..	2	1	1	1	..	1	1	..	1	..	..	..	11,512
	102°–103°	..	3	1	..	..	..	..	..	..	..	1	..	2	..	..	..	..	1	1	16,580
	103°–104°	..	1	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	13,000
Pulse	90.	8	3	..	1	1	..	1	5	3	..	..	..	..	..	..	..	..	..	..	9,009
	90–100.	14	16	3	3	1	5	..	5	6	3	3	1	3	2	1	..	..	..	1	10,967
	100–110.	9	9	1	1	3	2	1	2	4	2	2	..	1	1	..	..	..	..	..	9,908
	110–120.	4	13	3	..	..	..	1	3	3	2	4	1	3	2	..	..	..	1	2	13,541
	120–130.	3	2	3	..	..	..	2	1	1	..	1	..	..	1	..	1	..	1	..	12,261
	130–140.	..	1	1	..	..	..	..	..	..	..	1	..	..	1	..	..	..	..	..	14,000
	140+.	..	2	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..	14,750
Favorable?	Class I: No	1	4	..	..	1	..	..	..	1	1	1	..	1	..	..	..	..	..	..	11,000
	Class I: Yes	20	6	1	4	3	3	3	7	4	1	1	..	..	..	1	..	..	..	..	8,869
	Class II: No	7	10	2	..	..	2	1	4	3	4	1	1	1	1	..	1	..	..	..	11,832
	Class II: Yes	2	3	..	..	..	1	..	1	1	1	1	..	..	..	..	..	..	..	1	13,266
	Class III: No	8	24	7	2	..	2	2	2	9	2	7	1	5	5	..	..	..	2	1	13,092
	Class III: Yes	..	1	1	..	..	..	..	..	..	..	..	..	1	1	..	..	..	..	1	15,250
Loss of Weight	0.	8	2	2	1	2	2	1	2	1	1	..	..	..	2	..	..	..	..	..	9,052
	0–10 lb.	14	12	2	2	1	2	3	6	4	1	4	1	2	1	..	1	..	..	1	10,998
	10–20 lb.	9	19	2	1	..	2	1	5	7	2	5	..	5	1	..	1	..	..	2	12,232
	20–30 lb.	5	8	2	1	1	1	..	2	1	1	3	1	2	1	..	..	..	1	..	12,075
	30–40 lb.	..	3	..	..	..	..	..	..	3	..	..	..	..	..	..	..	..	..	..	10,800
	40–50 lb.	2	2	..	1	..	1	..	..	1	1	..	..	..	..	..	..	..	..	..	8,975
	50+ lb.	1	..	2	..	..	..	..	1	..	..	..	..	..	2	..	..	..	..	..	12,500

TABLE B.

		Polymorphonuclears.							Lymphocytes.								Large Mononuclears.						
		3–6000	6–9000	9–12,000	12–15,000	15–18,000	18,000 +	Average per c.mm.	10–1500	15–2000	20–2500	25–3000	30–3500	35–4000	4000 +	Average per c.mm.	0	0–100	1–200	2–300	3–400	4–500	Average per c.mm.
Class	I.	13	15	3	1	..	..	6,472	3	7	7	5	5	4	1	2,517	2	23	7	..	..	..	74
	II.	4	16	2	2	1	1	8,891	..	3	5	11	2	2	3	2,853	2	16	7	..	1	..	84
	III.	4	12	17	6	3	..	9,802	3	8	12	6	9	4	..	2,541	2	30	6	1	2	1	87
Age	10–20 yrs.	..	7	3	2	1	..	8,970	1	2	1	3	5	1	..	2,645	1	8	3	1	..	..	101
	20–30 yrs.	8	20	8	3	2	1	8,528	2	5	11	8	7	5	4	2,769	3	27	11	..	1	..	77
	30–40 yrs.	8	8	4	2	1	..	7,955	2	4	8	5	3	..	..	2,380	1	17	3	..	1	1	91
	40–50 yrs.	2	3	2	2	..	..	8,918	..	4	..	2	..	3	..	2,692	1	6	1	..	1	..	80
	50–60 yrs.	1	3	4	..	..	..	8,718	1	2	1	2	1	1	..	2,448	..	7	1	..	..	..	54
	60–70 yrs.	1	3	1	..	..	..	7,366	..	1	3	1	..	..	..	2,232	..	2	3	..	..	..	105
Duration of Disease	3 mo.	2	8	4	..	2	..	11,875	..	1	5	6	3	..	1	2,719	1	14	4	1	1	..	108
	3 –6 mo.	5	6	7	2	1	..	8,748	1	4	5	5	2	4	..	2,516	2	17	1	..	1	..	89
	6 mo.–1 yr.	6	12	3	4	..	..	8,092	1	6	7	3	4	2	2	2,909	4	18	3	..	..	..	54
	1 –2 yrs.	3	4	5	1	..	..	8,511	2	3	3	2	2	1	..	2,299	..	9	3	..	1	..	96
	2 –4 yrs.	3	6	2	2	..	..	8,521	1	3	..	5	3	1	..	2,622	1	10	2	..	..	..	50
	4+ yrs.	1	2	..	1	..	1	11,254	1	1	2	..	..	..	1	2,398	1	1	2	1	..	..	118
Hemoptysis	Class I: No	7	11	3	1	..	..	7,081	2	5	4	4	3	3	1	2,555	2	14	6	..	..	..	79
	Class I: Yes	6	4	..	..	..	..	5,132	1	2	3	1	2	1	..	2,432	..	9	1	..	..	..	62
	Class II: No	1	11	2	1	1	..	9,783	..	1	3	7	1	2	2	2,955	..	9	6	..	1	..	110
	Class II: Yes	3	5	..	1	..	1	7,464	..	2	2	4	1	..	1	2,690	2	7	1	..	..	..	41
	Class III: No	3	5	11	2	2	..	9,490	1	6	8	1	5	2	..	2,538	1	15	3	1	2	1	77
	Class III: Yes	1	7	6	4	1	..	10,180	2	2	4	5	4	2	..	2,544	1	15	3	..	..	..	98
Sputum	0.	5	5	2	1	..	..	6,796	1	2	2	2	3	2	1	2,697	..	8	5	..	..	..	89
	0–1 oz.	10	17	10	2	2	1	8,522	2	7	9	10	7	5	2	2,686	3	30	7	1	1	..	77
	1–2 oz.	1	4	..	3	..	..	9,119	..	1	2	1	2	2	..	2,937	..	5	2	..	1	..	125
	2–4 oz.	4	8	5	..	1	..	8,400	1	5	4	3	3	2	..	2,450	1	15	2	..	..	..	55
	4–8 oz.	..	7	5	3	..	..	9,696	1	3	5	5	1	..	..	2,366	2	7	4	..	1	1	104
Cavity?	No.	1	3	4	1	1	..	9,742	1	1	4	..	2	2	..	2,559	..	9	..	..	1	..	71
	Yes	2	7	8	5	..	..	9,990	1	5	4	5	5	2	..	2,542	2	16	3	..	..	1	80
Temperature	99°	10	16	6	..	..	1	7,619	2	9	8	6	3	4	1	2,480	1	22	10	..	..	..	76
	99°–100°	8	16	6	3	1	..	8,128	2	4	9	6	6	4	3	2,700	4	23	6	..	1	..	69
	100°–101°	3	6	3	3	1	..	8,879	2	2	3	6	3	..	..	2,473	1	11	3	..	1	..	79
	101°–102°	..	3	3	2	..	..	9,710	..	2	2	1	1	2	..	2,695	..	6	1	..	1	..	105
	102°–103°	..	..	3	..	2	..	13,180	..	..	1	2	1	1	..	2,938	..	2	1	1	..	1	197
	103°–104°	..	..	1	..	..	..	11,310	..	1	..	..	..	..	..	1,514	..	1	..	..	..	..	78
Pulse	90.	4	7	..	..	..	..	6,441	1	3	3	3	1	..	..	2,231	1	6	4	..	..	..	80
	90–100.	9	15	6	2	..	1	8,002	2	6	5	9	4	5	2	2,662	1	22	9	..	..	1	82
	100–110.	7	8	3	1	..	..	7,218	2	3	5	2	6	1	..	2,504	..	17	2	..	..	..	63
	110–120.	..	8	9	2	3	..	10,458	1	4	5	4	4	3	1	2,712	2	14	4	..	2	..	91
	120–130.	1	4	1	2	1	..	9,377	..	2	3	2	..	2	..	2,535	1	6	..	1	1	..	105
	130–140.	..	..	1	1	..	..	11,560	..	..	2	..	..	..	..	2,222	1	1	..	..	..	..	24
	140+.	..	..	2	..	..	..	11,445	..	..	..	1	1	..	..	2,950	..	1	1	..	..	..	132
Favorable?	Class I: No	1	2	2	..	..	..	7,769	..	..	1	2	..	2	..	3,058	..	5	..	..	..	..	52
	Class I: Yes	12	13	1	1	..	..	6,232	3	7	6	3	5	2	1	2,417	2	18	7	..	..	..	78
	Class II: No	2	15	..	2	1	..	7,980	..	3	3	9	2	1	2	2,802	2	13	4	..	1	..	81
	Class II: Yes	2	1	2	..	..	1	10,259	..	..	2	2	..	1	1	3,026	..	3	3	..	..	..	93
	Class III: No	4	11	16	6	3	..	9,687	3	6	12	3	9	3	..	2,506	2	26	5	..	2	1	88
	Class III: Yes	..	1	1	..	..	..	11,877	..	..	..	1	..	1	..	3,178	..	2	..	..	..	..	60
Loss of Weight	0.	5	3	1	1	..	..	6,500	4	2	3	1	..	..	..	2,268	1	8	1	..	..	..	55
	0–10 lb.	8	12	5	2	1	..	7,980	2	7	4	5	6	3	1	2,618	2	19	6	..	1	..	81
	10–20 lb.	3	17	9	2	1	1	9,045	1	2	8	8	5	6	3	2,935	1	21	11	..	..	..	81
	20–30 lb.	3	2	7	1	1	..	9,415	2	3	4	1	3	1	..	2,375	1	11	..	..	1	1	99
	30–40 lb.	..	3	..	..	..	..	8,141	..	..	2	1	..	..	..	2,350	..	1	2	..	..	..	100
	40–50 lb.	2	2	..	..	..	..	6,578	1	1	1	1	..	..	..	2,018	..	3	1	..	..	..	73
	50+ lb.	..	1	..	1	..	..	9,977	..	1	..	1	..	..	..	2,342	..	4	..	..	..	..	39

TABLE C.

		Transitionals.						Basophiles.						Eosinophiles.					
		0	0–50	50–100	100–200	200–400	Average per c.mm.	0	0–25	25–50	50–100	100–200	Average per c.mm.	0	0–100	100–200	200–400	400–600	Average per c.mm.
Class	I.	2	11	8	6	5	93	10	10	7	4	1	25	2	14	7	3	1	97
	II.	2	2	9	6	7	115	8	5	6	5	2	38	5	10	9	1	1	97
	III.	2	9	15	12	4	100	27	7	6	2	..	11	2	24	9	7	..	104
Age	10–20 yrs.	1	5	3	3	1	80	5	5	2	1	..	19	1	5	3	3	1	135
	20–30 yrs.	2	8	16	10	6	109	20	6	10	4	2	25	3	25	12	2	..	83
	30–40 yrs.	1	7	6	6	3	122	7	7	3	5	1	31	3	14	3	3	..	110
	40–50 yrs.	1	1	3	2	2	148	6	2	1	..	..	9	1	3	3	2	..	112
	50–60 yrs.	1	..	3	3	1	104	5	1	1	1	..	13	1	3	4	..	..	92
	60–70 yrs.	..	1	1	..	3	172	2	1	2	..	..	15	..	2	1	1	1	190
Duration of Disease	3 –3 mo.	3	6	4	3	..	139	5	4	4	3	..	26	2	7	5	2	..	101
	3 –6 mo.	1	5	7	6	2	106	8	4	7	2	..	22	3	7	9	2	..	101
	6 mo.–1 yr.	1	6	9	4	5	113	14	6	2	2	1	18	..	15	6	3	1	114
	1 –2 yrs.	1	4	3	4	1	85	7	3	3	..	..	14	1	8	1	2	1	102
	2 –4 yrs.	1	1	5	4	2	108	7	1	2	2	1	31	2	8	2	1	..	77
	4+ yrs.	..	1	1	2	1	202	2	2	1	..	..	18	1	3	..	1	..	87
Hemoptysis	Class I: No	2	7	3	6	4	99	8	7	4	2	1	23	2	10	6	3	1	113
	Class I: Yes	..	4	5	..	1	80	2	3	3	2	..	28	..	9	1	..	..	62
	Class II: No	1	2	4	3	6	177	6	4	4	1	1	36	1	7	7	..	1	106
	Class II: Yes	1	..	5	3	1	122	2	1	2	4	1	42	4	3	2	1	..	84
	Class III: No	..	8	6	7	2	101	15	4	3	1	..	11	2	13	4	4	..	99
	Class III: Yes	2	1	9	5	2	99	12	3	3	1	..	11	..	11	5	3	..	109
Sputum	0.	2	5	2	2	2	91	5	5	2	1	..	19	..	10	2	1	..	85
	0–1 oz.	2	11	11	11	7	115	19	6	9	7	1	23	6	17	14	4	1	102
	1–2 oz.	1	1	4	1	1	132	3	4	1	..	..	15	..	4	4	..	..	86
	2–4 oz.	1	3	8	4	2	98	10	3	4	1	..	17	1	9	3	4	1	127
	4–8 oz.	..	2	6	4	3	144	8	2	2	2	1	26	2	9	2	2	..	98
Cavity?	No.	..	1	6	1	2	154	5	2	3	..	..	16	..	5	3	2	..	130
	Yes.	2	5	8	5	2	83	15	4	1	2	..	12	1	13	4	4	..	104
Temperature	99°.	3	8	10	8	4	90	14	10	4	3	2	26	3	17	8	4	1	102
	99°–100°.	2	8	11	7	6	120	12	9	8	5	..	23	2	18	9	5	..	102
	100°–101°.	..	2	7	4	3	109	8	1	5	2	..	20	2	9	3	1	1	103
	101°–102°.	1	1	2	2	2	170	7	1	..	..	..	2	1	4	3	..	..	80
	102°–103°.	..	1	1	3	..	111	2	1	1	1	..	25	1	2	1	1	..	128
	103°–104°.	..	..	..	1	..	78	1	..	..	..	..	0	..	1	..	..	..	26
Pulse	90.	1	4	3	2	1	79	3	4	2	2	..	24	.	4	4	3	..	128
	90–100.	4	6	8	9	6	122	14	8	5	4	2	21	4	17	8	3	1	100
	100–110.	..	6	6	4	3	143	7	4	6	2	..	23	1	13	4	1	..	76
	110–120.	..	5	7	6	4	142	12	4	5	1	..	15	2	12	3	4	1	118
	120–130.	1	1	5	1	1	123	5	2	1	1	..	15	1	2	6	..	..	106
	130–140.	..	..	2	..	..	96	2	..	..	..	..	0	..	2	..	..	..	96
	140+.	..	..	..	1	1	148	1	..	..	1	..	29	1	1	..	..	..	45
Favorable?	Class I: No	..	1	1	2	1	115	2	1	1	1	..	25	1	2	2	..	..	79
	Class I: Yes	2	10	7	4	4	89	8	9	6	3	1	25	1	17	5	3	1	100
	Class II: No	1	1	7	5	6	175	7	3	5	4	1	35	4	8	6	1	1	101
	Class II: Yes	1	1	2	1	1	90	1	2	1	1	1	47	1	2	3	..	..	83
	Class III: No	1	8	13	10	4	105	23	7	5	1	..	12	1	23	6	6	..	100
	Class III: Yes	1	..	1	..	..	32	2	..	..	..	..	0	..	1	1	..	..	103
Loss of Weight	0.	..	3	4	2	1	103	3	4	2	1	..	22	..	6	3	1	..	100
	0–10 lb.	2	8	6	7	5	117	11	7	6	3	1	23	1	13	7	6	1	131
	10–20 lb.	4	5	10	7	7	122	15	6	6	5	1	25	6	16	8	3	..	81
	20–30 lb.	..	3	6	4	1	94	6	3	4	1	..	20	1	10	3	..	..	68
	30–40 lb.	..	2	1	..	..	51	3	..	..	..	..	0	..	1	1	1	..	124
	40–50 lb.	..	..	1	2	1	152	1	2	1	..	..	28	1	2	..	..	1	126
	50+ lb.	..	..	1	1	..	104	2	..	..	..	..	0	..	2	..	..	..	43

TABLE D.—TREATED CASES.

	Whites.			Lymphocytes.		
	Increased.	Decreased.	Average Per Cent. of Increase.	Increased.	Decreased.	Average Per Cent. of Increase.
Class I (14 cases).....	9	5	7.6	9	5	16.9
Class II (17 cases).....	9	7*	0.9	8	9	6.4
Class III (19 cases).....	13	6	23.7	15	4	28.1

TABLE E.—LYMPHOCYTES ON BASIS OF PERCENTAGE INSTEAD OF ACTUAL NUMBER PER C.MM.

	Increased.	Decreased.	Average Per Cent. on First Count.	Average Per Cent. on Second Count.	Gain in Per Cent.
Class I (14 cases).....	9	5	28.6	30.9	2.3
Class II (17 cases)....	7	9†	25.4	26.8	1.4
Class III (19 cases)....	13	4‡	21.9	22.9	1.

In the "favorable" table only those cases have been marked favorable which in the six months since the count have shown a very definite improvement, and one that promises to be permanent. It is thought that the other tables will be found self-explanatory.

A word as to our classification of the large mononuclears and transitionals will not be out of place. As large mononuclears we have classed only those cells which were of very large size and contained a large, faintly basophilic nucleus, with a large rim of protoplasm, also staining feebly basophilic. As transitionals we have classed only those cells which had a deep and distinct indentation in the nucleus. In each case a differential count of 500 cells was made. Wright's stain was used.

It has been thought best, in our tables, to give the actual number of the different cells to the cubic milimeter rather than the percentage. However, we have given also the percentage of lymphocytes in the treated cases.

TOTAL WHITE COUNT

The total count of white cells for the first, second, and third stage cases averaged 9218, 12,125, and 12,179 respectively. The individual counts,

* One stationary. † *Ibid.* ‡ Two stationary.

however, varied greatly, as can be seen from the table. Age seemed to have no effect on the counts. As to the duration of disease, the counts showed a tendency to fall as the duration increased. This is interesting, as a rise in the count would be expected as the disease progressed into the second and third stages. The cases of four and more years' standing showed a high average, due to one unusually high count occurring as one of a small number of cases. Contrary to the usual finding, our non-hemorrhagic cases had higher averages in the first and second classes than did the hemorrhagic. The hemorrhagic cases ran higher in the third class. The cavity cases ran, on an average, about 2000 cells higher than those without cavity. (It should be noted that we have included in the "cases without cavity" only class III cases.) As the sputum increased in amount, the counts ran higher, but there was a great variation in the individual figures. The same holds true of temperature and pulse. As these increased we found a small and uncertain increase in the white count. With a loss of weight up to 30 pounds the leukocytes increased, from 30 to 50 pounds loss, there was a decrease in the count, but the cases which had lost more than 50 pounds showed the highest average of all. In class I the unfavorable cases had a higher leukocyte count than the favorable ones. The reverse holds good for classes II and III.

POLYMORPHONUCLEARS

These cells ran parallel in every way with the total white count. When there was a high white count, a high percentage of polymorphonuclears was practically always found, so that what has been said for the white cells holds good for the polymorphonuclears.

LYMPHOCYTES

The lymphocytes averaged highest in the class II cases. Classes I and III were practically the same. The tables for age, duration, sputum, cavity, temperature, pulse, and weight show nothing of any interest. The non-hemorrhagic cases counted higher than the hemorrhagic ones in classes I and II. In class III the averages were practically the same. Contrary to the usual finding, our favorable class I cases showed a considerably lower average than the unfavorable cases. In classes II and III the greater number of lymphocytes was found in the favorable cases.

LARGE MONONUCLEARS, BASOPHILES, EOSINOPHILES, AND TRANSITIONALS

Nothing of interest has been found in connection with any of these cells. We have noticed a low basophile count in our class III cases, and in the cases above forty years of age. Forty-two class III cases gave an average basophile count of only 11 per c.mm., and in 27 of the 42 cases no basophiles at all were found. In 9 cases between forty and fifty years of age there was an average of only 9 basophiles, while in 6 of the 9 cases none were found. From fifty to sixty years, 5 out of 8 cases showed no basophiles, and the average was 13. From sixty to seventy years 2 out of 5 showed no basophiles, and the average was 15. In the class III cases we think this low count may be explained by the high total leukocyte count in these cases. In counting from a smear which contains many white cells it would often happen that 500 cells would be counted without finding a basophile, or at most only 2 or 3 of them. The cases above forty years of age, however, did not show a higher total leukocyte count than the cases below forty years. Still, the number of basophiles was small. We are not able to attach any significance to this, and are inclined to attribute it to the element of chance which is connected with the counting of those cells which show a very low percentage.

TREATED CASES

To determine the effect of sanatorium treatment on the blood, second counts were made on 50 cases, two to two and a half months after admission. We desired especially to find whether treatment would give an increase in the lymphocytes.

Fourteen class I cases were examined. The total white count was found increased in 9 of these. There was an average increase of 7.6 per cent. The lymphocytes were also increased in 9 of the 14 cases, with an average increase for the 14 cases of 16.9 per cent.

In class II there was also an increase in both the total leukocyte and the lymphocyte counts. The white cells were increased in 9 out of 17 cases, with an average increase of 9 per cent. The lymphocytes were increased in 8 of the 17, with an average increase of 6.4 per cent.

In class III, out of 19 cases, 13 showed an increase in leukocytes and 15 an increase in lymphocytes. The average increase was 23.7 per cent. for the white cells and 28.1 per cent. for the lymphocytes. We have attempted to correlate the increase or decrease of lymphocytes with the improvement or

decline of the patients, but have not succeeded. In our class II cases there seems to be some connection between a decrease of lymphocytes and the decline of the patients. Of the 9 class II patients who showed a decrease in lymphocytes after treatment, 7 have been progressive or have merely held their own. The remaining 2 have made good improvement, although they were the 2 who gave the greatest percentage of decrease in lymphocytes. In classes I and III the figures are completely at variance so far as any connection with the course of the disease is concerned.

The lymphocytes were also analyzed according to percentage. This has shown the same general result as the analysis made according to the actual number per cubic millimeter. The percentages on the second count averaged higher in each of the classes than they did in the first count. However, we can trace no constant relation in individual cases between the percentage of lymphocytes and the condition of the patient.

CONCLUSION

We feel that few definite conclusions can be drawn from our work. In fact, the only reason for reporting the work is our idea that negative results are of considerable value. Certain things may be found to hold good in averaging a number of cases, but in an individual case of tuberculosis little can be determined from a blood examination. For example, leukocytes in our class I cases average about 9000, but an individual count might be anywhere from 5000 to 16,500, which was the range in this group. The same has held true in different phases of tuberculosis. In fact, we have not found the number of white cells, or any division of the differential count, to bear a constant relation to any stage or phase of pulmonary tuberculosis.

Our work indicates that neither a leukocyte nor differential count is of practical value in determining the stage of the disease in a given case, nor can we consider it an aid in prognosis.*

* Valuable assistance has been rendered us in this work by Dr. Harry S. Wagner, of the Westfield State Sanatorium, and by Dr. George L. Schadt, of Springfield, Mass.

SOME REMARKS ON THE MODE OF INFECTION AND OF DISSEMINATION OF TUBERCULOSIS IN MAN BASED ON ANATOMICAL INVESTIGATION*

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The following remarks are based on an anatomical study of 224 cases of active tuberculosis in 1000 consecutive autopsies:

Any attempt at solving the question of the mode of infection and of dissemination in tuberculosis through anatomical investigation may seem ill advised and a waste of time and energy in the light of the experimental work of Baumgarten,[1] Calmette and Guérin,[2] Schlossmann and Engel,[3] Ravenel and Reichel,[4] and of Oberwarth and Rabinowitsch,[5] which seems to prove that, under experimental conditions at least, tubercle bacilli are rapidly disseminated by the blood- and lymph-stream from the point of primary infection,—from the alimentary canal, for instance,—and may produce manifestations in other organs without leaving any anatomically demonstrable traces at their point of entry, nor even in the regional lymph-nodes. Still, I believe that there is ample reason to doubt whether, even though we should accept the work mentioned as absolutely conclusive in this regard,—which to my mind it is not,—the result of such experimental investigation is directly applicable to man. It is impossible for me here to enter into a detailed discussion of the disputed points, and I abstain from such an attempt all the more readily as others, like Fischer and Fischer[6] and Beitzke,[7] have already done so at great length and have come very much to the same conclusion. I am, however, not fully prepared to accept Albrecht's[8] statement: "Eine Frage in Hinsicht auf die Infektions-weise der Tuberkulose beim Menschen existiert längst nicht mehr. Die Versuche, die zur Aufdeckung dieser Infectionswege immer von neuem angestellt werden, sind vollständig überflüssig. Experimente an Tieren, die zu keinem anderen Zweck angestellt werden, sind direkt verwerflich. Die pathologische Anatomie—und zwar im wesentlichen schon die makro-

* From the Pathological Laboratory of Cooper Medical College and of Stanford University.

skopische Anatomie—giebt für die weitaus grösste Zahl der Fälle menschlicher Tuberkulose ein völlig klares und einwandfreies Bild ihrer Entstehung und Verbreitung." (For a long time there has been no question in regard to the mode of infection in tuberculosis of man. The experiments which are constantly being made to discover this mode of infection are entirely superfluous. Experimentation on animals expressly designed for this purpose should be discarded altogether. Pathological anatomy—to a great extent gross anatomy—reveals clearly and without possibility of objection its mode of origin and of dissemination.)

Animal experimentation has and always will continue to throw much light on moot questions in human pathology, but it seems unreasonable to be altogether too ready to overthrow the result of years of painstaking anatomical investigation on the basis of a comparatively small number of experiments on animals which, when all is said and done, imitate natural conditions but crudely. In the last resort pathological anatomy always must remain our guide in determining what is and what is not likely to occur in the human body.

I personally believe that, through the work of Birch-Hirschfeld,[9] Schmorl,[10] and Abrikossoff,[11] it is proved that in man pulmonary tuberculosis may commence in the small bronchi of the apical portion of the lungs, which, in such cases, certainly would suggest a primary infection by way of the bronchial tree. When we, then, take into account the great similarity in localization of the oldest lesions and in the extension of these lesions to other parts of the lung in the ordinary cases of pulmonary tuberculosis it becomes, to my mind, at least, highly probable that in all or at least in a majority of cases the mode of infection is a similar one, especially when we bear in mind that Schmorl[10] has shown that the localization of the lesions is quite different in those cases in which evidently the infection of the lungs has taken place in some other manner—by the blood-stream, for instance.

Taking this much for granted, the further extension of the process in the diseased lungs is readily determined by anatomical investigation, and I have been struck more and more with the importance of the bronchial tree in the general dissemination of the infectious material in the lungs in such cases, especially in adults. Tuberculosis in children differs so much from chronic pulmonary tuberculosis in adults that the two conditions should be strictly separated. My own experience is quite convincing in this regard, and the fundamental difference between them is very clearly brought out in Harbitz's[12] large series of cases. In children, the lymphatics play a much more important rôle in the general dissemination of the process in the lungs.

My attention was first directed to the importance of the bronchial tree as a means of the more general dissemination of the tubercular process in the lungs of adults by my studies on the pneumonic complications in pulmonary phthisis.[13] Not only in these pneumonic processes, but in the more nodular manifestations of the disease also there is strong evidence of such bronchial dissemination. The caseated small bronchus is rarely missing in the center of the single or conglomerate tubercle, and it is certainly astonishing how slightly the peribronchial lymph-glands may be affected in advanced cases of pulmonary tuberculosis. The course of the dissemination of the tubercular process from the bronchi to trachea, larynx, pharynx, mouth, and intestinal canal is also quite evident, and needs no further discussion. Of interest remain those cases in which the mode of infection and of dissemination is more or less unusual, not so much because of the greater rarity of such observations, but because they help to throw a clear light on the nature and character of the tubercular infection in general.

I have selected from my material 49 such cases, and have grouped them under the following headings: Primary intestinal tuberculosis in adults; multiple primary infections; primary tuberculosis of peribronchial lymph-glands and tubercular polyserositis; generalized tuberculosis of the lymphatic system in an adult; apparently primary tuberculosis of the larynx; and tuberculosis of the genito-urinary system. Several cases naturally appear repeatedly in these series, because they present several of these conditions simultaneously.

PRIMARY INTESTINAL TUBERCULOSIS IN ADULTS

1. IX-49. Miss B., twenty-two years. Tubercular ulcer of cecum; tuberculosis of appendix; recent tuberculosis of Fallopian tubes and of uterus. No tuberculosis elsewhere. (See X-5 of next series.)

2. VI-55. H., man, middle age. Scar in ileum and old tubercular ulcer in ascending colon; chronic tuberculosis of both adrenals, with Addison's disease; conglomerate tubercle in left lobe of liver; no tubercular lesions elsewhere.

3. VI-76. E. B., man, forty-two years. Two small tubercular ulcers in transverse colon; tubercular ulcers of rectum and in vicinity of anus; acute disseminated miliary tuberculosis; no old lesions found in respiratory tract.

These cases represent evidently primary infections of the intestines; it is of interest to note that in two of them the tubercular lesions found were

confined to the abdominal cavity. In the following cases the infection of intestinal tract seems to be a primary one, although old tubercular lesions or lesions suspicious of healed tuberculosis were found in the respiratory tract.

MULTIPLE PRIMARY INFECTIONS

A. Double Infection

1. X-29. M. S., man, twenty-six years. Comparatively recent conglomerate tubercles in posterior lower part of right upper and deep in left upper lobe, 3 cm. below apex; no other tubercular lesions in lungs nor in peribronchial lymph-glands; small group of tubercles in Peyer's patches near ileocecal valve; no visible tuberculosis of mesenteric or retroperitoneal lymph-glands; tubercular caries of thoracic spine.

2. X-20. M. C., male, nine years old. Old tuberculosis of peribronchial lymph-glands; two old tubercular ulcers in ileum; more recent ulcers in transverse colon; old tuberculosis of mesenteric and retroperitoneal lymph-glands; disseminated miliary tuberculosis; tubercular pleurisy and beginning tubercular peritonitis.

3. X-5. A. A., woman, thirty-two years. Small black scar at left apex; few large tubercles in Peyer's patches; large tubercular ulcers of appendix; tubercular peritonitis; chronic tuberculosis of Fallopian tubes and of uterus; chronic tuberculosis of left kidney and of bladder; acute disseminated miliary tuberculosis. (See IX-49 of preceding series.)

4. IX-42. A. S., emaciated boy. Small scars at apices; two apparently old tubercular ulcers in Peyer's patches; no visible tuberculosis in mesenteric or retroperitoneal lymph-glands; recent tuberculosis of left peribronchial lymph-glands; tubercular pleurisy on left side; tubercular peritonitis; emphysema on right side.

5. IX-14. A. B., man, sixty-two years. Small scar at left apex; enlargement and calcification of some mesenteric lymph-glands; no other tubercular lesions.

6. V-52. Middle-aged man. Small scars and adhesions at left apex; old tubercular ulcer of cecum, with perforation and formation of large tubercular intraperitoneal abscess; tuberculosis of mesenteric lymph-glands.

7. V-41. Very old man. Old tubercular scar at left apex; many old, ring-shaped tubercular ulcers in small intestine and cecum; marked old tuberculosis of mesenteric and retroperitoneal lymph-glands; chronic tubercular peritonitis; chronic adhesive tubercular pleurisy on right side; scattered tubercles in right lower lobe of lung.

8. V-25. M. W., man, thirty-five years. Black, cone-shaped scar at left apex; tuberculous pleurisy on left side; in upper ileum several small, shallow tuberculous ulcers; large caseous glands in mesentery, chronic tuberculosis of genital tract and of right hip; acute disseminated miliary tuberculosis.

9. V-89. S. E. G., emaciated old man. Tubercular scars in both upper lobes; tubercular pleurisy on left side; one small old tubercular ulcer in ileum.

10. V-123. G. C. C., man, forty-six years. Old calcified scars at both apices; chronic miliary tuberculosis of both lungs; no cavities; few shallow ulcers in ileum; chronic tuberculosis of genital tract; tubercular peritonitis.

11. III-6. J. A. B., man, sixty years. No primary lesions in lungs or intestines; chronic tuberculosis of peribronchial and of mesenteric lymph-glands; chronic tuberculosis of genito-urinary tract; malignant epithelioma of bladder.

12. III-93. A. A., old man. Small conical scar at left apex; tubercular ulcers and miliary tuberculosis in ileum; tuberculosis of mesenteric lymph-glands; tubercular caries of thoracic vertebræ; tubercular pleurisy on right side; acute disseminated miliary tuberculosis.

B. Triple Infection

13. XI-34. V. H., male, nine months. Tuberculosis of left tonsil and of one submaxillary lymph-gland on left side; old tuberculosis of one of the right peribronchial lymph-glands, of one lymph-gland at bifurcation, and of one in anterior mediastinum; tubercular pleurisy and beginning tubercular peritonitis; few small tubercles in Peyer's patches; one small, shallow tubercular ulcer in transverse colon; tuberculosis of mesenteric lymph-glands; none in retroperitoneal, posterior mesenteric, nor in deep cervical lymph-glands; tubercular meningitis.

In case I the unusual localization of the tubercular process in the lungs might suggest an infection from the intestines by way of the blood-current, all the more as there existed another hematogenous metastasis in the form of a caries of the spine In the second case the old tubercular lesions in the peribronchial lymph-glands might be referred to an ascending infection from the retroperitoneal lymph-glands through the posterior mediastinum, although I do not believe this to be very likely. The same argument might apply, but with even less force, to case 11. It may seem doubtful whether the small scars observed at the apices in cases 3, 5, 6, and 12 without other tubercular lesions in the respiratory tract are really to be looked upon as

tubercular in origin. My own experience makes me inclined to believe that they are, because in other similar cases I have usually succeeded in finding more definitely tubercular lesions in other parts of the lungs or in the peribronchial lymph-glands.

These cases of apparently multiple primary infection with tuberculosis are extremely interesting. The possibility of such an occurrence is, of course, frequently realized, but experiments upon animals would make it probable that, as a result of the primary infection, the body becomes more or less resistant to a renewed implantation of the tubercle bacilli. Baldwin,[14] in Osler's "Modern Medicine," says in this regard: "Experimentally reinfections are not easily produced in animals, yet successive infections are usually assumed to have occurred in persons who have had a history of healed lymphatic tuberculosis in childhood. On the other hand, cumulative infection in tuberculous families seems impossible to deny in young children under repeated exposure." Ribbert[15] and Lubarsch[16] were the first to point out that such an assumption is at times necessary in order to explain the localization of the tubercular lesions. Ribbert[15] reports three such cases, of which cases 1 and 2 are very similar to those reported in this series, whereas case 3 is somewhat less convincing, on account of the existence of more advanced lesions in the lungs, from which the intestines certainly might have become infected. Harbitz[12] also, among his cases of primary intestinal tuberculosis in adults, reports similar cases. He says: "Überhaupt sollte die Aufmerksamkeit in weit höherem Grade als früher geschehen auf die wiederholten Infektionen . . . gerichtet werden." (At all events attention should be directed more than formerly to repeated infections.) Otherwise medical literature seems to be silent on this point, and cases like case 13, with probably triple primary infection, have so far not been reported.

In all these cases, apart from the pulmonary lesions, a primary intestinal infection is very probable. This would increase the number of primary intestinal infections in adults in our series—if we exclude cases 2, 4, and 13 as being in children—to 13 in all, or approximately 5.8 per cent. of the active cases of tuberculosis and 1.3 per cent. of all autopsies. This is a much smaller figure than that arrived at by Harbitz,[12] who, in a somewhat larger series of cases, found 30 cases of primary intestinal tuberculosis in adults, of which 22 showed severe lesions. He calculates that these cases constitute 18 per cent. of his cases of tuberculosis, and he believes that 15 to 20 per cent. of cases of ordinary pulmonary tuberculosis are of intestinal origin. The latter statement is open to doubt in my mind.

The smaller percentage of primary intestinal infections in my cases is

due to the fact that I excluded all cases with open pulmonary lesions, because in such cases it is purely a matter of opinion whether one shall look upon the pulmonary or the intestinal lesions as primary. The cases which I selected, therefore, cannot contribute in any way to the solution of the question, whether ordinary pulmonary tuberculosis is ever, or if so how frequently, of intestinal origin. It seems practically impossible to decide this point on the basis of anatomical investigation. The fact that tubercle bacilli of the bovine type have never been found in typical pulmonary tuberculosis would seem to be somewhat opposed to this idea, although it, of course, does not furnish any absolute proof one way or the other.

Cases X-5 and IX-49 are interesting examples of the extension of the tubercular process from the appendix to the internal genital organs of the female.

PRIMARY TUBERCULOSIS OF PERIBRONCHIAL LYMPH-GLANDS AND TUBERCULAR POLYSEROSITIS

A. Primary Tuberculosis of Peribronchial Lymph-glands

1. VIII-22. F. B., man, twenty-five years. Necrotic calcified area in peribronchial lymph-gland on right side; no other tubercular lesions found; case of glomerulonephritis.

2. VI-48. J. K., man, seventy years. Chronic tuberculosis of peribronchial lymph-glands; no tubercular lesions elsewhere; case of emphysema and of cardiac hypertrophy.

3. VIII-70. A. Y. F., man, sixty-five years. Chronic tuberculosis of peribronchial lymph-glands, of those in posterior mediastinum, and at hilus of liver; no tuberculosis of intestines or mesenteric or retroperitoneal lymph-glands; secondary tuberculosis of lungs; few metastatic tubercles in liver; case of old syphilis and of subacute glomerulonephritis.

4. XI-21. M. C., female, eighteen years. Subacute tuberculosis of peribronchial lymph-glands and those at bifurcation; no tuberculosis of lymph-glands of neck; none in abdominal cavity; secondary tuberculosis of lungs; beginning tuberculosis of right pleura; tubercular meningitis.

B. Primary Tuberculosis of Peribronchial Lymph-glands and Tuberculosis of Serous Membranes

5. VIII-61. Young man. Old tuberculosis of peribronchial lymph-glands; perforation into bronchus, with formation of cone-shaped area of caseous pneumonia; secondary tuberculosis of rest of lungs; serofibrinous

tubercular pleurisy on both sides; serofibrinous tubercular peritonitis; tuberculosis of retroperitoneal lymph-glands and those at hilus of liver; no tuberculosis of intestines or mesenteric lymph-glands; beginning cirrhosis.

6. I-61. F. J. A., man, twenty-five years. Chronic tuberculosis of left peribronchial lymph-glands; adhesive pleurisy on both sides; chronic adhesive tubercular peritonitis; no tuberculosis in rest of respiratory or in digestive tract; acute disseminated miliary tuberculosis.

7. VI-4. D. G., man, twenty years. Slight chronic tuberculosis of right peribronchial lymph-glands; dry tubercular pleurisy on both sides; secondary tuberculosis of left lung; dry tubercular peritonitis; no tuberculosis of intestines; miliary tuberculosis of mesenteric lymph-glands, of liver, of spleen, and of kidneys; conglomerate tubercle in cerebellum; tubercular meningitis.

C. Tuberculosis of Serous Membranes Apparently Commencing in Pleura

8. X-20. M. C., male, ten years. Chronic tuberculosis of peribronchial lymph-glands; old tubercular ulcers in intestines; chronic tuberculosis of mesenteric and retroperitoneal lymph-glands; chronic disseminated tuberculosis of lungs, of liver, and of spleen; tubercular meningitis; tubercular pleurisy on both sides, and tubercular peritonitis in upper part of peritoneal cavity.

9. XI-34. V. H., male, nine months. Tuberculosis at apices; chronic tuberculosis of one right peribronchial, of one lymph-gland at bifurcation, and of one anterior mediastinal lymph-gland; tuberculosis of left tonsil and one submaxillary lymph-gland; tuberculosis of intestines and of mesenteric lymph-glands; dry tubercular pleurisy on right side and tubercular peritonitis in upper part of peritoneal cavity.

10. VI-74. J. McC., male, fifty-nine years. Old tubercular scars at both apices; small cavity surrounded by acute lesions in middle lobe; small tubercular ulcer in colon; serofibrinous tubercular pleurisy on left side; recent tubercular peritonitis.

11. I-108. E. C., young man. Small old cavity on right upper lobe; old scar near left apex; scattered tubercles in rest of lungs; no tuberculosis of intestinal tract; chronic caseating pleurisy on left side; recent dry tubercular pleurisy on right side; adhesive tubercular peritonitis; miliary tuberculosis of spleen and of liver; recent tuberculosis of mesenteric lymph-glands.

12. II-48. D. McK., man, forty years. Large tubercular scars at both apices; chronic serofibrinous tubercular pleurisy on right side; recent tubercular pericarditis; case of chronic gouty nephritis.

13. III-18. W. D., man, fifty-seven. Old tubercular scars at both apices; peribronchial lymph-glands normal; old tubercular ulcers at vocal cords; no tuberculosis in intestinal tract; subacute serofibrinous tubercular pleurisy on both sides; acute serofibrinous peritonitis.

14. V-76. J. D. O'N., man, thirty-eight years. Old tuberculosis at right apex; scattered old tubercles in left lung; calcified necrotic area in one of left peribronchial lymph-glands; no tubercular lesions in intestinal tract; serofibrinous tubercular pleurisy on both sides; serofibrinous tubercular peritonitis; tuberculosis of spleen; cirrhosis.

15. XI-57. Z., man, twenty-five years. Old tubercular focus with central cavity in middle lobe; peribronchial lymph-glands normal; no tuberculosis of intestines; old adhesive tubercular pleurisy on both sides; old adhesive tubercular peritonitis; recent tuberculosis of mesenteric and retroperitoneal lymph-glands; miliary tuberculosis of spleen.

16. VIII-57. C. H., man, middle age. Few old tubercles and recent tuberculous focus in left upper lobe in lungs; old tuberculosis of right peribronchial lymph-glands; few tubercles in lymph-glands at arch of aorta; small tubercular ulcer at ileocecal valve; tuberculosis of mesenteric lymph-glands; serofibrinous pleurisy on both sides; more recent serofibrinous tubercular peritonitis; cirrhosis.

17. V-89. S. E. G., old man. Tubercular scars in both upper lobes; small old tubercular ulcers in ileum; serofibrinous tubercular pleurisy on left side; beginning fibrinous pericarditis.

18. IX-42. A. S., male, nineteen years. Small scars at apices; old tubercular ulcers in ileum; recent tubercular serofibrinous pleurisy on left side; recent tuberculosis of left peribronchial lymph-glands; recent serofibrinous tubercular peritonitis.

19. IX-51. Man, middle age. Old scars at both apices; no intestinal lesions; serofibrinous tubercular pleurisy on right side; recent tuberculosis of peritoneum with effusion; recent tuberculosis of peribronchial, mesenteric, retroperitoneal, cervical, and axillary lymph-glands; disseminated tuberculosis of lungs, of spleen, and of liver; splenomyelogenous leukemia.

D. Tuberculosis of Serous Membranes Apparently Starting in Peritoneum

20. XII-65. A. B., woman, thirty-nine years of age. Small scar at left apex; few old scars in right peribronchial glands; no tuberculosis of intestines; few tubercles in mesenteric lymph-glands; tubercular peritonitis with effusion; disseminated miliary tuberculosis; cirrhosis.

21. X-5. A. A., woman, thirty-two years. Small scar at left apex;

few tubercles in Peyer's patches; large tubercular ulcers of appendix; dry tubercular peritonitis; chronic tuberculosis of Fallopian tubes and of uterus; chronic tuberculosis of left kidney and bladder; acute disseminated miliary tuberculosis.

22. V-123. G. C. G., man, forty-six years. Old calcified scars at both apices; chronic miliary tuberculosis of both lungs; few small tubercular ulcers in ileum; chronic tuberculosis of genital tract; beginning tubercular peritonitis; beginning cirrhosis.

23. VII-60. D. S., man, thirty-five years. Small scar at left apex; chronic tuberculosis of peribronchial lymph-glands; tuberculosis of lymph-glands in lower anterior mediastinum; no tubercular lesions in intestines; chronic adhesive and serofibrinous peritonitis; serofibrinous tubercular pleurisy in lower parts of both pleuræ.

24. V-41. Old man. Old tubercular scar at left apex; many large old tubercular ulcers in intestines; marked old tuberculosis of mesenteric and of retroperitoneal lymph-glands; chronic adhesive tubercular peritonitis; chronic adhesive tubercular pleurisy on right side; scattered tubercles in right lower lobe.

E. Apparently Primary Tuberculosis of Serous Membrane

25. VI-68. Z. K., man, thirty-six years. No primary tubercular foci discovered in respiratory or in intestinal tract nor in lymph-glands; chronic tubercular serofibrinous pleurisy on right side; disseminated miliary tuberculosis (recent) of lungs, of spleen, and of liver.

Primary tuberculosis of the peribronchial lymph-glands is of very common occurrence in children; in fact, Harbitz[12] believes it to be the rule in infections of the respiratory tract in them, and claims that any infection found in the pulmonary tissue in such cases is usually secondary by direct extension from the peribronchial glands or by perforation of them into the bronchi. I may say that my limited experience with tuberculosis in children confirms this view. In adults such a primary disease of the peribronchial glands is much more exceptional, and it is suggestive that in our series of seven cases four were in young people, and in two others (cases 1 and 2) it is quite possible that the lesions found were old remnants of an infection acquired in childhood.

Cases 4, 5, 6, and 7 seem to show that tuberculosis of the peribronchial lymph-glands may play an important rôle in the infection of the pleura; in fact, in case 4 the extension of the disease from the peribronchial lymph-glands to the pleura, evidently by way of the lymphatics, could be readily

recognized. On the right side, on which the peribronchial glands were more extensively involved, the pleura near the root of the lung over the middle lobe was studded with tubercles which were arranged along the course of the lymphatics and became less numerous as one advanced from the infected glands toward the periphery. I have since seen similar cases.

The points which I wish to bring out in regard to tuberculosis of the serous membranes are, first, the frequency with which more than one serous membrane is affected—a fact emphasized by Hamman[17] in dealing with tubercular peritonitis; second, the comparatively insignificant character, frequently, of the primary visceral lesions, as compared with the changes in the serous membranes, which latter determine the clinical picture more or less exclusively, and, furthermore, how contrary to the common belief, in adults, at least, the disease commences much more frequently in the chest than in the abdomen (15, as against 5 cases). One of the cases of evidently initial infection of the pleura was seen in an infant nine months old.

Writers on tubercular peritonitis usually mention the possibility of an infection of the pleura from the peritoneum, and not the rather more frequent occurrence of the reverse. This may be due to the fact that, clinically, the pleurisy in such cases may be less easily noticed. Allchin,[18] for instance, in Allbutt's "System of Medicine," says: "When the peritoneal tuberculosis is mainly miliary in character and especially involves the parietal layer, one or both pleuræ may be affected, the disease spreading from one serous membrane to the other." "Pleurisy developed in this way *is frequently dry*."

GENERALIZED TUBERCULOSIS OF THE LYMPHATIC SYSTEM IN AN ADULT

In his excellent monograph on the "Frequency, Localization, and Dissemination of Tuberculosis" Harbitz[12] describes several of these interesting cases of general involvement of the lymphatic system in the tubercular process, of which I found the following example among my own records:

VII-19. J. M., man, forty-six years. No tubercular lesions found in lungs or in intestines; chronic tuberculosis of lymph-glands of neck, of peribronchial lymph-glands, of lymph-glands at cardia, and at hilus of liver, of mesenteric lymph-glands; chronic tubercular perihepatitis and pericarditis.

The disease probably commences in one set of lymph-glands and slowly spreads to the others. In our case the peribronchial lymph-glands seemed to show the oldest lesions.

APPARENTLY PRIMARY TUBERCULOSIS OF LARYNX

In view of the rarity of well-authenticated cases of primary tuberculosis of the larynx, I wish to put the following case on record:

I-90. J. H. H., old man. No tuberculous lesions or scars in lungs; no tuberculous lesions in intestinal tract; tuberculous ulcer over processus vocalis of right cricoid cartilage; tuberculosis of deep cervical lymph-glands; no tubercular lesions noticed on tonsils; case of pernicious anemia.

CASES OF CHRONIC TUBERCULOSIS OF THE GENITO-URINARY SYSTEM

1. I-94. E. F., man, middle age. Advanced pulmonary tuberculosis; marked tuberculosis of peribronchial lymph-glands; pleuritic adhesions and serofibrinous pleurisy on the left side; no intestinal lesions; moderate number of large conglomerate tubercles in kidneys.

2. III-78. G. T., man, middle age. Advanced pulmonary tuberculosis; many tubercular ulcers in respiratory and intestinal tract; tuberculosis of both adrenals; tuberculosis of lower half of right kidney; of renal pelvis, of bladder, prostate, and urethra.

3. VII-70. D. F. L., man, middle age. Advanced pulmonary tuberculosis; tuberculosis of lower lumbar vertebræ; tuberculosis of adrenals; few tubercular lesions in intestinal tract; chronic tuberculosis of left kidney, of bladder, and of prostate.

4. VIII-38. D. P., man, thirty years. Advanced pulmonary tuberculosis; tubercular ulcers in respiratory and intestinal tract; few small subcapsular tubercles in kidneys; chronic tuberculosis of prostate, of seminal vesicles, and of epididymis.

5. VII-11. J. B., man, middle age. Advanced tuberculosis of lungs; tuberculosis of intestines; chronic tuberculosis of both kidneys, of both renal pelves and ureters, of bladder, of prostate; renal calculus size of almond in right renal pelvis.

6. V-129. M. H., woman, thirty-two years. Healed tuberculosis of lungs; intestines not examined; chronic tuberculosis of left kidney and of left ureter.

7. V-142. F. W., man, fifty-six years. Healed tuberculosis of lungs and of one of peribronchial lymph-glands; intestines not examined; chronic tuberculosis of right kidney and of right ureter; tuberculous cavity in prostate; chronic tuberculosis of both epididymides and of testes.

8. VI-42. M. C., man, forty-three years. Healed tuberculosis of lungs; intestines not examined; tuberculous abscess in prostate; tuberculosis of left seminal vesicle and of right epididymis and testis; chronic tuberculosis of lower dorsal vertebræ and of piece of twelfth rib; also tubercular abscess at junction of fourth rib and sternum; acute disseminated miliary tuberculosis.

9. VI-75. P. R., old man. Healed tuberculosis of lungs; intestines not examined; two old conglomerate tubercles in right renal cortex; death from arteriosclerosis.

10. XII-68. F. S., man, forty years. Healed tuberculosis of lungs; no intestinal lesions; closed tubercular cavity at upper pole of right kidney; caseous foci in prostate; right testis removed for tuberculosis.

11. V-25. M. W., man, thirty-five years. Healed tuberculosis of lungs; several small shallow tubercular ulcers in ileum; tuberculosis of right hip; chronic tuberculosis of prostate, of seminal vesicles, and of left epididymis; acute disseminated miliary tuberculosis.

12. V-133. G. C. G., man, forty-six years. Healed tuberculosis of lungs; few shallow tubercular ulcers in ileum; chronic tuberculosis of prostate, of seminal vesicles, and of right epididymis.

13. X-5. A. A., woman, thirty-two years. Small black scar at left apex; few tubercles in Peyer's patches; tubercular ulcers in appendix; tubercular peritonitis; chronic tuberculosis of Fallopian tubes and of uterus; general disseminated miliary tuberculosis; chronic tuberculosis of left kidney and of left ureter.

14. IX-49. Miss B., twenty-two years. Tubercular ulcer of cecum; tuberculosis of appendix; recent tuberculosis of Fallopian tubes and of uterus. No other tubercular lesions.

15. III-6. J. A. B., man, sixty years. No primary lesions in lungs and intestines; chronic tuberculosis of peribronchial and mesenteric lymph-glands; old conglomerate tubercle in right kidney; chronic tuberculosis of prostate and of testes; epithelioma of bladder.

16. V-4. C. C. H., man, forty-three years. No tubercular lesions found in lungs, intestinal canal, or in lymph-glands; extensive old, practically healed tuberculosis of right kidney and of right ureter, healed tuberculosis of right epididymis and of right testis; also of right knee. Death from cerebral hemorrhage.

17. II-44. C. F., man, twenty-five years. No primary tubercular lesions found in respiratory or in intestinal tract. In left kidney caseous destruction of two pyramids. In cavity produced in this way several uric-

acid stones; several smaller ones further down in left ureter; miliary tubercles in left kidney, left renal pelvis, and in left ureter; old caseous focus in prostate; adhesive tuberculous perihepatitis; recent acute disseminated miliary tuberculosis.

My attention was first attracted to these cases through cases 16 and 17, in which no primary focus of infection had been discovered at autopsy. Such primary cases of genito-urinary tuberculosis have been repeatedly described in literature, but, on the whole, are regarded as being rather rare. It would seem to me that even these few apparently well-authenticated cases are hardly conclusive. It seems difficult to conceive how such a primary tuberculous infection of the genito-urinary tract should arise, in the male particularly, and the possibility of overlooking an old tubercular focus in the lungs or in one of the lymph-glands is so great that it seems proper to demand the most careful anatomical investigation of additional cases of this character before the occurrence of such a primary infection of the male genito-urinary tract can be looked upon as at all probable. The same argument applies in the case of apparently primary infection of a serous membrane, 25, series III.

Our collection of cases of genito-urinary tuberculosis again brings out quite strongly how comparatively rarely chronic tuberculosis of the genito-urinary system is associated with advanced pulmonary tuberculosis. There are only 5 cases of this kind, as against 12 in which the tubercular process in the lungs had healed (7 cases), or where there are old tubercular lesions in the intestines or lymph-glands only. Judging from our series, the primary lesions are much more frequently situated in the lungs than in the intestinal canal in this disease. Why tuberculosis of the genito-urinary tract should be so much more frequently associated with more or less quiescent lesions elsewhere it is difficult to say, except that we may assume that the kidney, when once infected, is not a very strongly resistant tissue to the advance of tubercular process. It may also be suggested that chronic renal tuberculosis does not frequently develop in ordinary cases of pulmonary tuberculosis, on account of its extremely chronic character; or, in other words, the consumptive patients usually die before there is any chance for the full development of the lesions of chronic tuberculosis in the genito-urinary organs.

Our cases also prove that tuberculosis of the internal genital tract of the male is not always dependent on preceding tuberculosis in the urinary tract, although frequently it undoubtedly is. This is shown quite clearly in cases 4, 8, 10, 12, 15, and 16, in which the renal lesions are either closed, or in which there are no renal lesions at all.

From cases 5 and 17 it would seem to me that the relation of calculus formation and renal tuberculosis to one another might be the subject of renewed investigation.

From the above presentation of cases I should draw the following conclusions:

1. Clear cases of primary tuberculosis of the intestinal tract in adults are quite rare—in our series, less than 6 per cent.

2. In quite a number of the more unusual types of tubercular infections in man it appears probable from the distribution of the anatomical lesions that we have to deal with primary multiple infections, which would make the same occurrence probable of occurrence in some of the ordinary cases of tuberculosis.

3. Tuberculosis of the serous membranes is apt to involve several of them, is frequently associated with comparatively insignificant lesions in the viscera, and is apt to commence in the pleura. The infection of the pleura, in some cases, evidently takes place directly from diseased peribronchial lymph-glands.

4. In males one occasionally observes cases of apparently primary tuberculosis of the genito-urinary tract. It is difficult, however, to exclude errors of observation in such instances.

5. The infection of the genito-urinary tract is usually primarily an infection of the kidneys, but may also occur elsewhere, as, for instance, in the prostate or the epididymis, or in both the kidneys and the genital tract.

6. Tuberculosis of the genito-urinary tract also is apt to be associated with comparatively insignificant or healed lesions elsewhere.

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DISCUSSION ON DR. OPHÜLS' PAPER

Dr. William H. Welch, Baltimore: It is interesting to observe the contrast between pathologic anatomists and bacteriologists and some clinicians, who are engaged merely in experimental work, in attempting to analyze their cases. Dr. Ravenel pointed out the inadequacy of that kind of evidence as to modes of infection. Pathological anatomists in general believe that the great preponderance of cases of pulmonary tuberculosis are referable to primary infection through the bronchi and lungs; they stand almost as a unit on that side of this disputed question. There is no question about the experimental facts as to the possibility of tubercle bacilli passing through the mucous membrane of the alimentary canal, without leaving a record behind, as the portal of entry; but, as Dr. Ophüls has pointed out, we are not justified, without further evidence, in applying these experimental results to conditions in human beings and rejecting all the older and all previously, almost universally, accepted ideas as to the paths of infection. This matter was threshed out very carefully in an interesting discussion in Vienna when the International Conference on Tuberculosis met there. At that time there was a most thorough and interesting presentation of the subject from all points of view, and I would recommend those who are particularly interested in this question to refer to that. One of Pflügge's pupils pointed out that it takes a vastly larger number of tubercle bacilli to produce infection through the alimentary canal than it does through the air-passages.

He believes that a single tubercle bacillus is sufficient to produce infection through the air-passages; from what Dr. Webb has taught us it is questionable whether a single tubercle bacillus, or less than a hundred tubercle bacilli, would be quite sufficient to produce infection by inhalation; whereas, it takes millions of times more tubercle bacilli to produce infection through the alimentary canal than it does from the respiratory passages. This is a significant fact.

Dr. Ophüls has expressly excluded from his consideration conditions in children. These are the ones where the widest observations have been made. There is no doubt that the great majority of cases of tuberculosis in children show lesions, and sometimes evidence of old lesions, in the peribronchial lymphatic glands. It has been shown by Hamburger, who has made very careful examinations in these cases of pulmonary lesions, that they do not go on to the gradation of pulmonary ulcerative phthisis; but that the lesions in the peribronchial glands in children are small, with evidence of their being really old lesions in the lungs. They are not necessarily apical lesions. The association of symptoms is quite small of old lesions in the lungs, so that I think we may say the rule is that, first, with tuberculous infection in children the lesions are probably in the lungs, and almost, at the same time, in the peribronchial lymphatic glands; and with it there is a remarkable tendency to the extension of the disease to other lymphatic glands. I can never reconcile myself to the idea that that kind of localization of the lesions in the peribronchial lymphatic glands can be explained except by their forced extension through the alimentary canal. So I believe in the older view that the infection is in the majority of instances, in cases of pulmonary tuberculosis, both in infants and adults, through the respiratory tract, and not through the alimentary canal; and, at the same time, I admit that we had no adequate conception in the old days as to the importance of the lymphatic route. It played a larger part than we dreamed of in the old days. Admitting all of that, it still remains that the majority of cases are due to infection through the respiratory route, and, in that respect, I have to differ from my friend, Dr. Ravenel, who, as is well known, is a strong advocate of the other view, that the infection is usually through the alimentary canal, his view being based upon experimental work.

We have had this subject presented by an expert pathological anatomist, who insists upon the fact that pathological anatomists have got a word to say on this subject as to the routes of infection.

Dr. Edward von Adelung, Oakland: I would like to ask the pathological anatomists as to the possibility of infection of the lungs through the tonsils

and cervical chains of glands, and whether infection through these pathways has been proved.

Dr. Welch: The members are probably familiar with the well-known views of Aufrecht, who holds that it is a temporary pathway of infection, that the entrance of the tubercle bacillus is usually through the pharynx, close to the lymphatic glands, and eventually the tubercle bacillus gets into the artery of the lungs, and he lays emphasis on the point that the tubercle bacilli appear to be in the wall of the small branches of the pulmonary artery in ordinary cases. However, I do not believe you can trace any such connection as that in the great majority of cases. It is not in conformity with the findings of those who have done considerable work on this subject.

Dr. Ophüls: In answer to Dr. von Adelung's question it is certainly very rare to find any evidence of such a dissemination at the autopsy table. There must be an as yet unexplained close relation between so-called scrofulosis in children or the chronic tuberculosis of the cervical lymph-nodes and pulmonary tuberculosis.

Harbitz, in his paper, quotes statistics from asylums in Sweden where scrofulous children are segregated. These statistics would seem to show that the vast majority of children who have been in these institutions, who have been discharged as benefited or as cured, still in after life contract pulmonary tuberculosis in some way or other. This to me seems to be a very significant phenomenon. We have no explanation to offer for it as yet, but it is a matter which should be looked into very closely.

The National Association for the Study and Prevention of Tuberculosis

CONSTITUTION AND BY-LAWS

LIST OF MEMBERS

April 1, 1912

CONSTITUTION AND BY-LAWS

CONSTITUTION

Article I.—Name

The name of this Society shall be The National Association for the Study and Prevention of Tuberculosis.

Article II.—Objects

The objects of the Association shall be: (*a*) The study of tuberculosis in all its forms and relations; (*b*) the dissemination of knowledge concerning the causes, treatment, and prevention of tuberculosis; (*c*) the encouragement of the prevention and scientific treatment of tuberculosis.

Article III.—Meetings

The meetings shall be held at such times and in such places as may be directed under the By-Laws.

BY-LAWS

Article I.—Membership

This Association shall consist of three classes of members: (*a*) Members; (*b*) Life Members; (*c*) Honorary Members.

(*a*) Those persons who participated in the organization of the Association at the meeting in Philadelphia on March 28, 1904, and such persons as shall from time to time be elected by the Board of Directors shall be Members so long as they comply with the provisions of the By-Laws. The dues of Members shall be Five Dollars ($5) a year.

(*b*) Members may become Life Members upon the payment of Two Hundred Dollars ($200).

(*c*) Persons distinguished for original researches relating to tuberculosis, or eminent as sanitarians, or as philanthropists who have given material aid in the Study and Prevention of Tuberculosis may be elected Honorary Members.

Article II.—Board of Directors

Section 1. The Association shall, at its first meeting, elect a board of thirty directors, divided into five groups of six each, to serve one, two, three, four, and five years, the duration of office to be determined by lot; thereafter, retiring directors, who have served a full term of five years, shall not be eligible for reëlection the year of retirement; provided, however, that this restriction shall not apply to the secretary or treasurer.

The Board of Directors may hereafter, at the annual meeting or at a special meeting of the Association, be increased to at least sixty, the additional members to be divided into groups in accordance with the provisions of the preceding paragraph of this section and subject to the same restrictions. It is furthermore provided that at least one-third of the total membership of the Board shall consist of laymen. At annual meetings succeeding the increase of the Board of Directors to a membership of sixty, twelve directors shall be elected for terms of five years, or, in case of vacancies in any of the groups, for such unexpired terms.

Section 2. The Board of Directors shall make its own rules; the government of the Association, the planning of work, the arrangement for meetings and congresses, and all other matters appertaining to legislation and direction shall be in its hands; committees shall have the power to execute only what is directed by the Board.

Article III.—Election of Officers

The Board of Directors shall annually elect from its own number a President, two Vice-Presidents, a Secretary, and a Treasurer, who shall be the officers of the Association as well as of the Board.

Article IV.—Committees

Section 1. The Board of Directors shall appoint an Executive Committee of seven directors, of which the President and the Secretary shall be members *ex officio*, to which shall be entrusted all the executive work of the Association.

SECTION 2. The Board of Directors is empowered to appoint representatives on the International Committee on Tuberculosis; it shall also from time to time appoint such committees as may be necessary for scientific and educational work, and for the holding of meetings and congresses.

ARTICLE V.—QUORUM

Seven Directors shall constitute a quorum of the Board of Directors.

ARTICLE VI.—MEETINGS

There shall be at least one stated annual meeting of the Association at a time and place to be fixed by the Board of Directors. Other meetings of the Association may be called by the Board at such times as it shall deem proper. The Executive Committee shall hold stated and other meetings as may be directed by the rules of the Board of Directors.

ARTICLE VII.—MONEYS

The moneys received from membership dues and from all other sources shall be used for defraying the expenses of the Association, and for furthering its objects under the direction of the Board of Directors.

ARTICLE VIII.—AMENDMENT OF CONSTITUTION

Propositions to amend the Constitution may be presented in writing at any meeting of the Board of Directors or of the Association; they shall be then referred to the Board of Directors for consideration and report. The Board of Directors shall report all propositions for amendment, whether submitted to it originally or by reference, at the meeting of the Association next following, when action may be taken; *provided, however,* that no proposition for amendment shall be voted upon within thirty days after its presentation, or without at least twenty days' notice of the meeting at which it is to come up for consideration, which notice shall set forth the proposed amendment in full. An affirmative vote of two-thirds the members present shall be required for adoption.

ARTICLE IX.—AMENDMENT OF BY-LAWS

By-Laws may be amended in the same manner as the Constitution or by a two-thirds vote of the members present at a meeting of the Board of Directors, provided that in the latter case the proposition to amend has been presented in writing at a previous meeting of the Association, or of the Board of Directors, and that subsequently to such presentation twenty days'

notice in writing has been given of the proposed amendment in the call for the meeting.

Article X.—Advisory Council

The Advisory Council of the National Association for the Study and Prevention of Tuberculosis shall consist of:

First. Directors of the Association.

Second. Officers or representatives appointed by various recognized State associations for the prevention of tuberculosis, such representatives being required to qualify as members of the National Association, the number in any case not to exceed five.

Third. Officers or representatives of various recognized local or municipal associations for the prevention of tuberculosis, such representatives being required to qualify as members of the National Association, the number in any case not to exceed three.

Fourth. A member of the medical staff of every public hospital or sanatorium for the exclusive care of tuberculous patients, such member to be designated by the board of trustees or other authorities of the hospital or sanatorium, such representative being required to qualify as a member of the National Association.

Fifth. A representative from the board of trustees or other executive authorities of approved hospitals or sanatoria for the exclusive care of tuberculous patients, such representative being required to qualify as a member of the National Association.

Sixth. Representatives of recognized, incorporated charitable societies or associations, such representatives being required to qualify as members of the National Association, the number in any case not to exceed three.

Seventh. The president or medical officer of the Health Department of any State or any city with a population of more than twenty thousand may become *ex officio* a member of the Advisory Council during his term of office.

The Advisory Council shall meet at the time of the annual meeting of the Association, and at such other times as it may be called together by the Directors or the President of the National Association. During the meetings of the National Association the Advisory Council shall have regular stated meetings at which members of the Council may bring up for discussion, or may present papers, which have been approved, bearing on the administrative control of tuberculosis, the management of hospitals and sanatoria, may make recommendations to the Board of Directors with regard to the conduct of the National Association, and other related subjects.

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GEOGRAPHICAL LIST OF THE MEMBERS OF THE NATIONAL ASSOCIATION FOR THE STUDY AND PREVENTION OF TUBERCULOSIS, APRIL 1, 1912

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INDEX

INDEX

Address of the President, 17
Advisory Council, 41
Albumin Reaction in the Sputum in Pulmonary Tuberculosis, by Lawrason Brown and W. H. Ross, 260
Anemia, Secondary, Treatment by Hypodermic Injection of Iron, by LeRoy S. Peters and E. S. Bullock, 291
Antiformin Method of Sputum Examination, by Frederick Tice, 266
Ayres, Leonard P., Open-air Schools, 77

Baldwin, Edward R., Investigations into the Nature of Tuberculin Sensitiveness, 351
Bedside Service in Tuberculosis, by William Porter, 273
Billings, Frank, Discussion in Advisory Council, 65
Discussion on Papers Regarding Climate, 250
Bonney, S. G., Experience with Pulmonary Tuberculosis During the Past Year, 235
Discussion on Papers Regarding Climate, 257
Boston's Hospital School for Tuberculous Children, by Edwin A. Locke and Timothy J. Murphy, 199
Bovine Tuberculosis, Control of, by Mazÿck P. Ravenel, 358
Bracken, H. M., Discussion in Advisory Council, 73
Brown, Lawrason, and W. H. Ross, Albumin Reaction in the Sputum in Pulmonary Tuberculosis, 260
Bullock, E. S., and LeRoy S. Peters, The Treatment of the Secondary Anemia of Tuberculosis by the Hypodermic Injection of Iron, 291

Car, Report of Traveling Tuberculosis Exhibit, by Winifred Doyle, 191
Chadwick, Henry D., and Roy Morgan, A Study of Leukocytes in 100 Cases of Pulmonary Tuberculosis, 386
Children, A Study of 60, by O. W. McMichael, 84
Children, Health of School, by Helen Marsh Wixson, 95
Cities, A Study of Three Small, by J. Byron Deacon, 183
City, Responsibility of, in the Tuberculosis Problem, by Clyde E. Ford, 53
Climate, The Present Attitude Toward, by Alexius M. Forster, 212
Clinical Section, 197
Constitution and By-laws, 415
Control of Tuberculosis in the Smaller Towns, by George R. Pogue, 179
Corwin, R. W., Discussion on the Child and the School, 106
Cost of Living, Tuberculosis as a Factor, by Edward F. McSweeney, 131
County Organized and Equipped to Control Tuberculosis, by George J. Nelbach, 170
County, Responsibility of, in the Tuberculosis Problem, by Hoyt E. Dearholt, 49

Deacon, J. Byron, A Study of Three Small Cities, 183
Dearholt, Hoyt E., Responsibility of the County in the Tuberculosis Problem, 49
Survey of Dunn County, Wisconsin, 157
Dissemination of Tuberculosis in Man, Mode of, by William Ophüls, 394
Dorsey, J. G., Discussion on Papers Regarding Climate, 247
Doyle, Winifred, Report on Traveling Tuberculosis Car of Missouri Association for the Relief and Control of Tuberculosis, 191

Dunn County, Wisconsin, A Survey of, by Hoyt E. Dearholt, 157

Economic Study of 500 Consumptives Treated in the Boston Consumptives' Hospital, by Edwin A. Locke and Cleaveland Floyd, 148
Evans, W. A., Methods of School Ventilation, 92
Executive Office Account, 15
Executive Secretary's Report, 29
Exhibits, School Health and Hygiene, by John B. Hawes, 2d, 102
Experience with Pulmonary Tuberculosis During the Past Year—A Clinical Résumé, by S. G. Bonney, 235

Families, Relief of, in which there is Tuberculosis, by H. Wirt Steele, 110
Farrand, Livingston, Report of Executive Secretary, 29
Discussion in Advisory Council, 67
Floyd, Cleaveland, and Edwin A. Locke, An Economic Study of 500 Consumptives Treated in the Boston Consumptives' Hospital, 148
Foley, Edna L., The Past and Present of the Tuberculosis Nurse, 120
Folks, Homer, Responsibility of the State in the Tuberculosis Problem, 44
Ford, Clyde E., Responsibility of the City in the Tuberculosis Problem, 53
Forster, Alexius M., The Present Attitude Toward Climate, 212
Discussion on Papers Regarding Climate, 255
Fricks, L. D., William Keiller, F. Simpson, and F. C. Smith, Report of 34 Cases of Tuberculosis Treated with Tuberculins and 18 with Mercury at the Marine-Hospital Sanatorium, 338

Geographical List of Members, 421
Gibson, J. D., Discussion on Papers Regarding Climate, 245
Gilbert, G. Burton, and Gerald B. Webb, The Specific Tissue Inoculation of Vaccines, 375
Gilbert, Oscar M., Discussion on Paper Regarding Climate, 246
Glover, Dr., Discussion on Control of Bovine Tuberculosis, 371
Gray, Ethan A., Discussion on Papers Regarding Climate, 244

Hawes, John B., 2d, School Health and Hygiene Exhibits, 102
Homan, R. B., Discussion on Secondary Infection in Pulmonary Tuberculosis, 323
Hypotension and Tachycardia in the Tuberculous, by John Ritter, 297

Infection in Early Life, Significance of its Great Frequency for Prevention of the Disease, by William H. Welch, 17
Infection, Mixed, in Pulmonary Tuberculosis, by Roswell T. Pettit, 310
Infection, Mode of, of Tuberculosis in Man, by William Ophüls, 394
Infections, Secondary, in Pulmonary Tuberculosis, by James L. Whitney, 318

Janeway, Dr. Edward G., His Contributions and Activities, by S. Adolphus Knopf, 34

Keiller, William, Report of 34 Cases of Tuberculosis Treated with Tuberculins and 18 with Mercury at the Marine-Hospital Sanatorium, 338
Kepford, A. E., Discussion on the Child and the School, 108
Kime, J. W., Discussion on Papers Regarding Climate, 246
Knopf, S. Adolphus, Dr. Edward G. Janeway, His Contributions and Activities in Behalf of the Anti-Tuberculosis Cause, 34
Discussion on Papers Regarding Climate, 252

Leukocytes in 100 Cases, by Henry D. Chadwick and Roy Morgan, 386

Leukocytic Picture, Effect of Tuberculin Treatment Upon, by Myer Solis-Cohen and Albert Strickler, 324
Locke, Edwin A., and Cleaveland Floyd, An Economic Study of 500 Consumptives Treated in the Boston Consumptives' Hospital, 148
and Timothy J. Murphy, Boston's Hospital School for Tuberculous Children, 199

McMichael, O. W., Four Months in the Open Air, 84
McSweeney, Edward F., Tuberculosis as a Factor in the Increased Cost of Living, 131
Discussion in Advisory Council, 69
Mathewson, H. S., Prognosis in Pulmonary Tuberculosis, 335
Members of the National Association for the Study and Prevention of Tuberculosis, 421
Mercury, Report of 18 Cases Treated with, by L. D. Fricks, William Keiller, F. Simpson, and F. C. Smith, 338
Meyer, Alfred, Discussion in Advisory Council, 71
Discussion on Control of Bovine Tuberculosis, 373
Morgan, Roy, and Henry D. Chadwick, A Study of Leukocytes in 100 Cases of Pulmonary Tuberculosis, 386
Morse, G. W., Discussion on Specific Tissue Inoculation of Vaccines, 383
Murphy, Timothy J., and Edwin A. Locke, Boston's Hospital School for Tuberculous Children, 199

Nelbach, George J., A County Organized and Equipped to Control Tuberculosis, 170
Nurse, The Past and Future of the Tuberculosis, by Edna L. Foley, 120

Official Responsibility in the Tuberculosis Problem, 41
Open Air, Four Months in the, by O. W. McMichael, 84
Open-air Schools, by Leonard P. Ayres, 77
Ophüls, William, Some Remarks on the Mode of Infection and of Dissemination of Tuberculosis in Man, Based on Anatomical Investigation, 394
Discussion on Infection and Dissemination of Tuberculosis, 411

Pathological Section, 349
Peters, LeRoy S., and E. S. Bullock, The Treatment of the Secondary Anemia of Tuberculosis by the Hypodermic Injection of Iron, 291
Discussion on Hypotension and Tachycardia in the Tuberculous, 305, 308
Discussion on Specific Tissue Inoculation of Vaccines, 384
Pettit, Roswell T., Studies on Mixed Infection in Pulmonary Tuberculosis, 310
Discussion on Secondary Infection in Pulmonary Tuberculosis, 323
Pogue, George R., The Control of Tuberculosis in the Smaller Towns, 179
Porter, William, Bedside Service in Tuberculosis, 273
President's Address, 17
Prognosis in Pulmonary Tuberculosis, by H. S. Mathewson, 335

Ravenel, Mazÿck P., Control of Bovine Tuberculosis, 358
Relief of Families in which there is Tuberculosis, by H. Wirt Steele, 110
Report of Executive Secretary, 29
Report of Meeting, 11
Report of Treasurer, 14
Responsibility of the City in the Tuberculosis Problem, by Clyde E. Ford, 53
Responsibility of the County in the Tuberculosis Problem, by Hoyt E. Dearholt, 49
Responsibility of the State in the Tuberculosis Problem, by Homer Folks, 44
Ritter, John, Hypotension and Tachycardia in the Tuberculous, 297
Discussion on the Antiformin Method of Sputum Examination, 270

Ritter, John—
Discussion on Hypotension and Tachycardia in the Tuberculous, 308
Ross, W. H., and Lawrason Brown, The Albumin Reaction in the Sputum in Pulmonary Tuberculosis, 260

Sachs, Theodore B., Discussion on Relief of Families in which there is Tuberculosis, 118
Discussion on the Past and Future of the Tuberculosis Nurse, 129
Discussion on Papers Regarding Climate, 243
Discussion on the Antiformin Method of Sputum Examination, 270
School Children, Health of, by Helen Marsh Wixson, 95
School Health and Hygiene Exhibits, by John B. Hawes, 2d, 102
School Ventilation Methods, by W. A. Evans, 92
Schools, Open-air, by Leonard P. Ayres, 77
Shortle, A. G., Discussion on Papers Regarding Climate, 248
Discussion on Hypotension and Tachycardia in the Tuberculous, 307
Significance of the Great Frequency of Tuberculous Infection in Early Life for Prevention of the Disease, by William H. Welch, 17
Simpson, F., and F. C. Smith, Report of 34 Cases of Tuberculosis Treated with Tuberculins and 18 with Mercury at the Marine-Hospital Sanatorium, 338
Smith, Frederick C., L. D. Fricks, William Keiller, and F. Simpson, Report of 34 Cases Treated with Tuberculins and 18 with Mercury at the Marine-Hospital Sanatorium, 338
Discussion on Papers Regarding Climate, 249
Discussion on Hypotension and Tachycardia in the Tuberculous, 307
Sociological Section, 75
Solis-Cohen, Myer, and Albert Strickler, The Effect of Tuberculin Treatment upon the Leukocytic Picture, 324
Spivak, C. D., Discussion on Papers Regarding Climate, 254
Sputum Examination with Special Reference to the Antiformin Method, by Frederick Tice, 266
State, Responsibility of, in the Tuberculosis Problem, by Homer Folks, 44
Steele, H. Wirt, Relief of Families in which there is Tuberculosis, 110
Stiles, Harold J., Discussion on Control of Bovine Tuberculosis, 365
Stone, Seymour H., Discussion on the Child and the School, 108
Strickler, Albert, and Myer Solis-Cohen, The Effect of Tuberculin Treatment upon the Leukocytic Picture, 324
Survey of Dunn County, Wisconsin, by Hoyt E. Dearholt, 157

Tachycardia and Hypotension in the Tuberculous, by John Ritter, 297
Tice, Frederick, Sputum Examination with Special Reference to the Antiformin Method, 266
Discussion on Sputum Examination, 272
Tissue Inoculation of Vaccines, by Gerald B. Webb and G. Burton Gilbert, 375
Towne, R. S., Discussion on Boston's Hospital School for Tuberculous Children, 211
Towns, Control of Tuberculosis in the Smaller, by George R. Pogue, 179
Traveling Tuberculosis Car, Report on, by Winifred Doyle, 191
Treasurer's Report, 14
Tuberculin Sensitiveness, Investigations into the Nature of, by Edward R. Baldwin, 351
Tuberculin Treatment, The Effect of, upon the Leukocytic Picture, by Myer Solis-Cohen and Albert Strickler, 338
Tuberculins, Report of 34 Cases Treated with, by L. D. Fricks, William Keiller, F. Simpson, and F. C. Smith, 338
Tuttle, Thomas D., Discussion on Control of Bovine Tuberculosis, 370

Vaccines, Specific Tissue Inoculation of, by Gerald B. Webb and G. Burton Gilbert, 375

Ventilation, Methods of School, by W. A. Evans, 92
von Adelung, Edward, Discussion on Boston's Hospital School for Tuberculous Children, 211
Discussion on Mode of Infection and Dissemination of Tuberculosis in Man, 410

Walters, William A., Discussion on the Antiformin Method of Sputum Examination, 271
Webb, Gerald B., and G. Burton Gilbert, The Specific Tissue Inoculation of Vaccines, 375
Discussion on Papers Regarding Climate, 255
Discussion on Control of Bovine Tuberculosis, 373
Discussion on Specific Tissue Inoculation of Vaccines, 385
Welch, William H., Presidential Address, The Significance of the Great Frequency of Tuberculous Infection in Early Life for Prevention of the Disease, 17
Discussion on Control of Bovine Tuberculosis, 367, 374
Discussion on Mode of Infection and Dissemination of Tuberculosis in Man, 409, 411
White, William Charles, Introductory Remarks to the Advisory Council, 41
Discussion on Boston's Hospital School for Tuberculous Children, 210
Discussion on Hypotension and Tachycardia in the Tuberculous, 306
Discussion on Specific Tissue Inoculation of Vaccines, 382
Whitney, James L., Secondary Infections in Pulmonary Tuberculosis, 318
Wilson, Dunning S., Discussion in Advisory Council, 74
Wixson, Helen Marsh, Health of School Children, 95

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